THE ENGINEERING CONSTRUCTION WEEKLY

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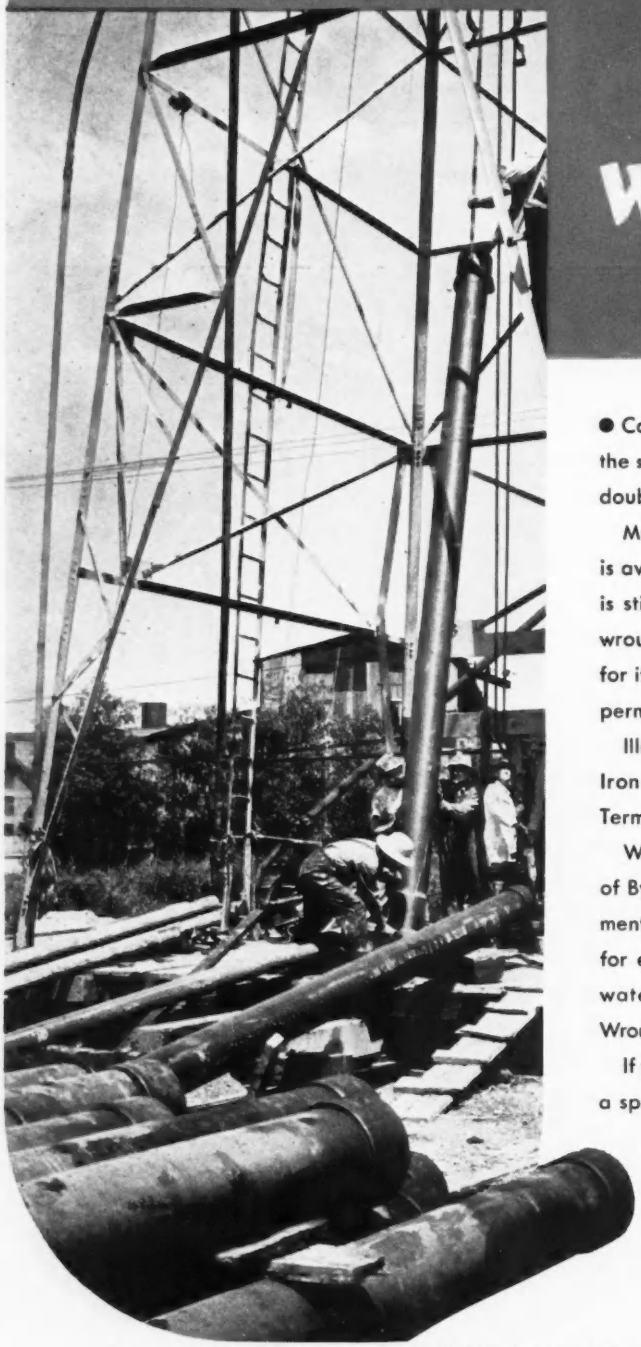
Engineering NEWS-RECORD

November 18, 1937

BRIDGES · IRRIGATION · FLOOD CONTROL · FOUNDATIONS · DAMS · HIGHWAYS · WATERWORKS · STREETS · SEWERS ·

For Double-Duty in WATER WELL CASING use BYERS WROUGHT IRON



● Corrosion attacks water well casing two ways: Outside from the soil, inside from the water—and Byers Wrought Iron does double duty in resisting both attacks.

Much evidence in the form of wrought iron service records is available. Many an old water well cased with wrought iron is still in service today. Experienced drillers who have used wrought iron for years recommend it above all other casing, for it not only resists corrosion, but also makes up easily into permanently tight joints regardless of size.

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As Government Enters New Fields—I

TODAY it may be accepted as an axiom of our national development that the federal government is destined to wield an increasing influence over the lives of the people. For a long time to come we probably shall retain the political structure of a federal union; but within the social and economic realms, state lines are bound to mean less and less.

This is a logical trend. The conservation and development of the national resources, wherever located, are matters of nationwide concern. The productive, mercantile and financial functions of our economy, wherever carried on, are of nationwide scope; every American is the customer or prospective customer of every other American. And the American standard of living, to which our entire economy is geared, must prevail throughout the nation if it is to be a reality rather than a phrase. The regulation of those functions that affect all these elements must become more and more a major concern of federal administration. No state or smaller subdivision can hope to live for itself alone if it would conserve the welfare of its own people, to say nothing of the general welfare. National economic unity is essential to individual well-being.

ALL THIS implies the strengthening and extension of federal departments, bureaus and other agencies. It means the development of a federal organization that eventually will touch at many points the personal and business activities of us all. Today we are shaping the pattern of that development; in large measure we are doing it unconsciously and at haphazard. And largely because we are doing it that way our people are dividing into opposing schools of extreme opinion.

Those of one school believe in the strong, centralized federal control. Only in that way, they contend, can we have the broad outlook and the long-term vision required to conserve the nationwide interest. They would reduce the influence of local politics, narrow vision and sectional bias by drowning them in federal authority. This school sees only the virtues of national management.

Those of the other school survey the current trend and shrink from an extension of federal control. They fear excessive standardization and a failure to consider local needs; they doubt the open-mindedness of federal bureaucrats. They would avoid the evils of remote and unresponsive control, academic theorizing and impractical procedure, by curbing federal control. They see only the virtues of local autonomy.

Whichever of these schools may claim our sympathy, it must be evident that the trend favors the first. The second is fighting a rear-guard action. In these basic functions we are headed for an increasing measure of federal participation. At this time our effort must be to establish that participation on a basis that will realize the benefits portrayed by its advocates and avoid the evils cited by its opponents.

IN DOING THIS, our first care must be to devote much more conscious effort to shaping the pattern of federal activity. Right now, one strong reason for the dissension between the two schools is the fact that so much of the federal participation has been bred of emergency. We have been working toward emergency objectives and using emergency tactics with emergency personnel. We have been doing things without mature consideration; frequently we have financed them by methods that cannot be considered in any long-term program. Too often, very great authority has been lodged in very small men. These, as usual, try to conceal their own shortcomings by an arbitrary attitude toward more competent men who, for the time being, dare not incur the federal ill will. In the name of emergency and humanity we have condoned a psychology of waste and extravagance that should have no part in permanent policies.

Say what we will to justify such practices on the ground of emergency, the fact remains that they discredit in the minds of many a healthy development of sound federal participation in legitimate areas. To curb these trends and allay this mistrust should be a major concern of those who advocate or who must administer the extension of federal activities that now is foreshadowed.

(*To be concluded in an early issue*)

Willard Chevalier

ENGINEERING NEWS-RECORD

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CLP-4 Low-Pressure Acetylene Generator

Height—Overall	51 in.
Diameter	14 in.
Weight—Empty	80 lb.
Weight—Fully Charged	215 lb.
Weight—Shipping	100 lb.
Full Charge—(No. 20 Carbic Processed Carbide)	8 cakes
Acetylene Yield per Charge	80 cu. ft.
Generating Capacity—Per hr.	45 cu. ft.

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VOL. 119 *NOVEMBER 18, 1937* No. 21

THIS WEEK AND NEXT

"TURNING THE RIVER" in great dam construction always is a red letter day. At Seminoe Dam it marked the culmination of eighteen months of difficult work, including a large tunnel for river diversion.

Paul Andersen, of the University of Minnesota, describes the design of piers on piles to resist ship impact.

A method of applying the vibration principle to cement-bound macadam street paving by laying slatted mats over the surface and rolling vibrators over them has been used in Nebraska.

Bars at smaller Pacific harbor entrances will soon be cut down by the U. S. Engineers' hydraulic sea-going hopper dredge "Pacific." The new ship, recently launched, features variable hopper capacity, and will remove material to a depth of 45 ft.

Electrical equipment for controlling the movement of lift and bascule bridges has been improved and changed in the last five years. The power selsyn system of coordinating two lifting elements is among the developments described by C. P. Hamilton of General Electric.

Experiences in groping for valves in rushing cold water and sand taught one waterworks man the value of maintaining an accurate system of valve maps and records. The method of records as well as the reason for them is related on page 831.

Engineering cannot be made a profession by statute, nor can engineers be condemned for joining unions, according to Willard Chevalier in a thought-stimulating talk abstracted in this issue.

TO REACH SOLID ROCK the foundations of Parker Dam had to be carried 235 ft. below the bed of the Colorado river. This unprecedented job will be described next week.

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THE COVER PICTURE is of the form jumbo in the spillway tunnel at Seminoe Dam.

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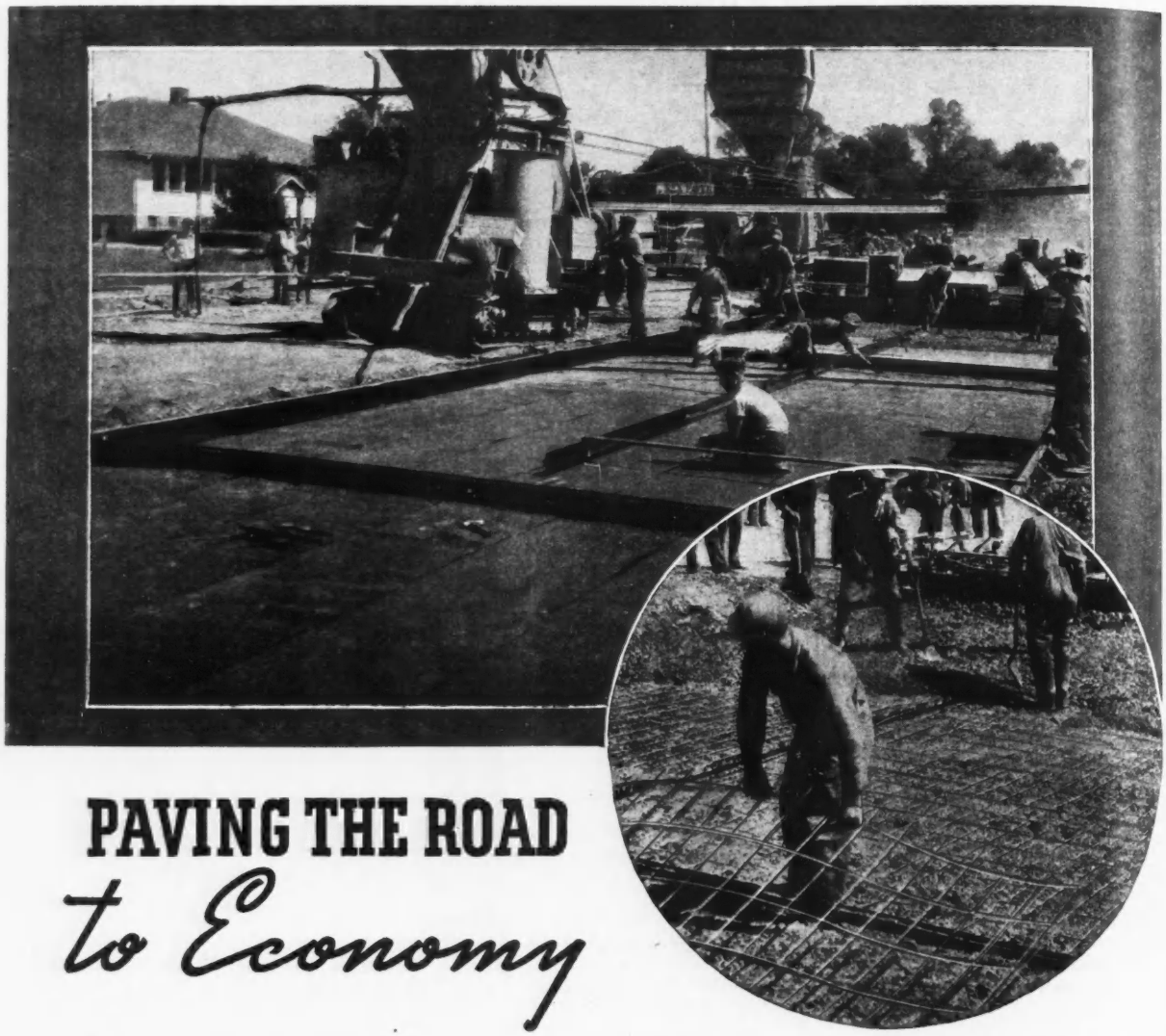

PAVING THE ROAD *to Economy*

Prevention of future avoidable maintenance costs was one of the objectives of highway engineers who specified Truscon Steel Products for the new road illustrated. An equally important objective will be accomplished when future savings in road maintenance costs will be made available for replacement of additional miles of obsolete roads in the state. • Permanent, wear-resisting, non-skid road surfaces are obtained with Truscon welded steel fabric. Truscon steel road forms with sliding connections provide perfect alignment . . . are easy to install . . . and contribute to road durability. • Truscon expansion joints and contraction plates absorb stresses in concrete bases and provide straight, uniform cracks when the concrete expands or contracts. Truscon rolled steel bars, curb bars, edge protectors and auxiliary equipment contribute to "paving the road to economy." For complete details, write Truscon Steel Company, Youngstown, Ohio, or communicate with the nearest of Truscon's 57 Sales-Engineering Offices.

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THE WEEK'S EVENTS

Building Stimulation To Be Tried

President names committee to find means to increase private residence construction

In an effort to stimulate construction by private capital of dwellings for rent and for sale, President Roosevelt has formed a committee of business and government leaders who will study the problem and submit recommendations for a program that can be conducted under government auspices. No direct investment of government funds is contemplated, however.

While no announcement has been made, it is known that the committee is studying the possibility of reducing housing costs in three fields—the cost of mortgage money, building materials, and labor. It is hoped that a program can be evolved that will require little or no new legislation and no new agencies. The present attempt is entirely independent of the new U. S. Housing Authority, which will operate exclusively in the field of public construction for the lowest income group.

Interest reduction

The hope of reducing interest rates below the present level centers around large-scale construction under a single mortgage agreement, possibly protected by some form of government insurance.

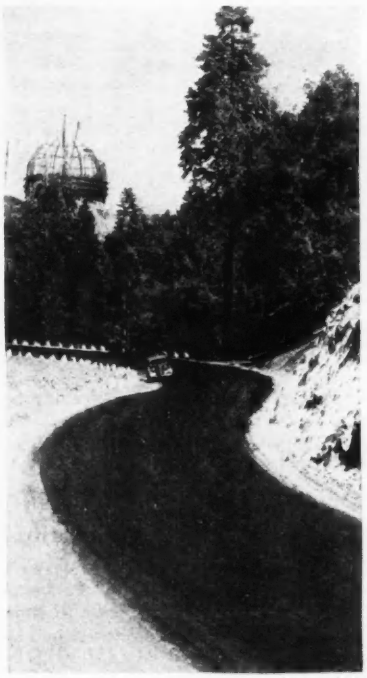
The Federal Housing Administration last week relaxed somewhat its rules controlling limited-dividend corporations coming under its mortgage insurance plan so as to permit, in some instances, the payment of 2 per cent dividends in addition to the 6 per cent now permitted. FHA is understood to be planning further modifications to encourage large-scale investments through modifications in the present law, which will have to be submitted for Congressional approval. These steps may be affected by the committee's studies.

Possible lowering of wage costs will be studied from two viewpoints: the possibility of a guaranteed annual wage, in return for which building labor might be induced to accept lower hourly rates; and the possible increase in output per man-hour through better planning, more efficient scheduling of work, and adoption of mass-production methods in large developments. While it is known that organized labor is opposed to any reduction in wage scales, it is hoped that some form of compromise may be arrived at.

Mass production

The committee will also survey the subject of more economical purchase of building materials resulting from large-scale operations. It is felt that by encouraging builders to get away from the old idea of planning one house at

(Continued on page 809)



Acme photo

STAR GAZERS' ROAD

IF SCIENTISTS are absent-minded as reputed, they still should be able to negotiate this $1,000,000 highway up the mountainside to the Mt. Palomar observatory near San Diego, Calif., which will house the 200-in. telescope, largest in the world. Construction of the road was made necessary by the problem of moving the 20-ton. telescope reflector and the quantities of material which were required for construction of a $6,000,000 observatory to be opened in 1939.

Shasta Dam Plans Are Changed

Increase in size of Central Valley structure will make it second largest concrete dam.

Shasta (Kennett) Dam is to be increased in size under revised plans announced by the Bureau of Reclamation, bringing its height to about 560 ft. and its length to 3,100 ft. The dam, a concrete gravity structure, will contain 5,700,000 cu.yd. of concrete, as compared with 4,360,000 cu.yd. for Boulder and 11,250,000 for Grand Coulee. The reservoir capacity will be 4,500,000 acre-ft., and the initial power installation is set at 280,000 kw. with provision for future enlargement to 350,000 kw. The dam will be located on the upper Sacramento River 13 miles north of Redding, Cal.

As originally planned, the dam was to be about 500 ft. high and to create a reservoir of 3,000,000 acre-ft. Further studies of water requirements

(Continued on page 808)

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Iowa Bond Tax Upheld By Supreme Court

State income taxes in Iowa can be levied on income from tax-exempt bonds of the state and its political subdivisions, according to a decision handed down by the U. S. Supreme Court Nov. 8. It affirms a previous decision of the Iowa state supreme court.

Bonds issued in 1934, before the state had enacted an income tax, carried a clause stating that they were immune from taxation. After the income tax was imposed in 1935 the state board of assessment and review held that interest received by owners of bonds should be included in their return of income subject to the tax. The holders protested this finding as impairing the obligation of contracts.

The state supreme court held that the exemption of the bonds from taxation applies to taxation of the bonds as property and does not cover the inclusion of the bond interest in taxable return of income. The U. S. Supreme Court has now upheld the Iowa decision 6 to 3, Justice Cardozo writing the opinion.

Globe photo

A NOVEL FOOTBRIDGE connecting the administration building of the 1939 New York World's Fair with other parts of the fair grounds.

Bridge Form Failure Kills One Man

Failure of temporary supports of the forms for a concrete highway bridge near Milltown, Ind. caused one span of the bridge to fall just as concrete placing was being finished and resulted in the death of one man and the injury of fifteen others.

The bridge, a $100,000 structure on state highway 64, was being built across three tracks of the Southern Ry. by R. T. Olinger Road Construction Co., the contractors. The bridge consisted of eight spans, of which six had been completed at the time of the accident.

All concrete had been placed in the span, which is 25x35 ft. in plan, when the structure failed, dropping the sixteen workmen 35 ft. to the ground. The bridge floor twisted as it fell and landed alongside the railroad instead of across the tracks.

• • •

Case School Gets Help In Sewage Study

More than $1,500 worth of sanitary and biological engineering equipment has been loaned by the Cleveland department of utilities to the civil engineering department of Case School of Applied Science in a cooperative program for the study of sewage disposal methods. The equipment will be used both for teaching and research work. The equipment was formerly at the city's Easterly sewage plant, and although it is still in excellent condition it was replaced by the city with more compact equipment in order to conserve floor space.

• • •

Fort Supply Flood Project To Get Under Way

Making an exception for the second time to the general shutdown of large federal flood control projects (*ENR*, Nov. 11, 1937, p. 768), Pres. Roosevelt has authorized the start of construction on the Fort Supply dam in Oklahoma. The dam is located on Wolf Creek, a tributary of the North Canadian River about 135 miles northwest of Oklahoma City. It will be an earth dam with an uncontrolled concrete spillway and a regulated discharge conduit. It will be about 2 miles long with a maximum height of 82 ft.

An interesting feature of the dam is that although primarily intended for flood control it will also impound water to supply Oklahoma City. The additional cost of this storage, about $2,000,000, will be paid by the city, while the federal government will furnish the $5,000,000 required to provide flood control facilities.

No power development is contemplated on the project. The reservoir will store 102,000 acre-ft. for flood control and 100,000 acre-ft. for water supply.

Feather River Power Plan Defended at Hearing

The 368,000-kw. power project on the north fork of the Feather River in California was termed the logical method by which the Pacific Gas & Electric Co. might obtain necessary capacity to meet the steadily increasing load on its system by two vice-presidents of the company, speaking at a Federal Power Commission hearing Nov. 15. The project has been attacked by California officials on the ground that it will compete with the Central Valley project (see p. 838).

Construction of the six plants involved in the project will be carried on in stages as the load develops, the witnesses said. Admitting that the company has expressed its willingness to absorb surplus power from the Central Valley development, the speakers stated that the uncertainty of completion of this federal development makes it necessary for the company to proceed with its own plans. They argued that Feather River need have no effect on Central Valley, since work can be suspended at any time.

On the following day this was denied by E. W. Kramer, regional director for the Federal Power Commission at San Francisco. If the first two proposed units are built, said Mr. Kramer, and 1942 is an average water year, the P. G. & E. system would be able to absorb only a tenth of the output from the Federal development.

THE CURRENT TREND

This week's news of contract volume and construction cost factors

Private Construction Ratio Gains

Construction financing by private investment still lags, now only third of predepression norm

Secretary of Treasury Morgenthau, in addressing the Academy of Political Science, last week said, "The basic need today is to foster the full application of the driving force of private capital. We want to see capital go into the productive channels of private industry. We want to see private business expand."

Applied to construction this thinking appears to be well timed and basicly sound. The accompanying chart illustrates the ratio of private to public construction from 1925 to date. In predepression years private construction, exclusive of small residential, regularly exceeded public construction volume by 50 to 100 per cent. During the depression this ratio was reversed. Now private and public construction have returned to a 50-50 ratio with the private volume trend going up. Washington news indicates that the Administration seeks ways to accelerate this trend.

The chart also illustrates a still more significant situation. Public work, in spite of the tremendous federal drive behind it sagged in 1932 and 1933 but otherwise has departed little from the even tenor of its way. By contrast private construction has had seven subnormal, low years during which housing, commercial and industrial construction has accumulated a powerful log jam of needed construction.

Willingness and ability to finance are the powder to start this jam blocking full recovery of private construction. Annually, prior to 1931, $1,750,000,000 was invested in corporate construction securities, another $1,500,000,000 in public works securities. This year, our 4th recovery year in private investment financing, only $600,000,000 will be invested in corporate construction securities and $500,000,000 in state and municipal construction bonds, only one-third of the post depression norm.

Where is this money? Is it waiting for more offerings or for higher yields? Are private individuals and organizations as well as public officials who wish to go ahead with construction neglecting to take advantage of the favorable financing rates that still obtain? Or are investors waiting for higher yields and clarified public policies? These answers obviously will determine the future course of construction.

Business Briefs

ANALYZING REASONS for the new industrial building construction which they have handled, Albert Kahn, Inc., Architects and Engineers find that 19 per cent is due to obsolescence, 56 per cent to business expansion, and 25 per cent to development of new products.

FLOOR AND WALL TILE shipments, except quarry tile in September 1937, totalled 4,491,017 square feet, the Bureau of Census reports. This is an increase of 3.3 per cent compared with August, and 9.6 per cent compared with a year ago. The total for the nine months of 1937, 38,493,544 square feet, is 27.1 per cent above 1936.

TRANSIT INDUSTRY REVENUE for the week ending November 6 is 1.02 per cent above the corresponding 1936 week, as reported in Transit Journal.

THIS WEEK'S FIGURES

(Thousands of Dollars)

CONTRACTS

	Week Ending Nov. 19 1936	Nov. 11 1937	Nov. 18 1937
Federal	$6,207	$ 731	$2,055
State & Municipal	22,943	20,858	22,600
Total public	$29,150	$21,589	$24,655
Total private	15,008	14,331	10,098
TOTALS	$44,158	$35,920	$34,753

Cumulative
1937 (46 weeks) $2,166,109
1936 (47 weeks) $2,070,402

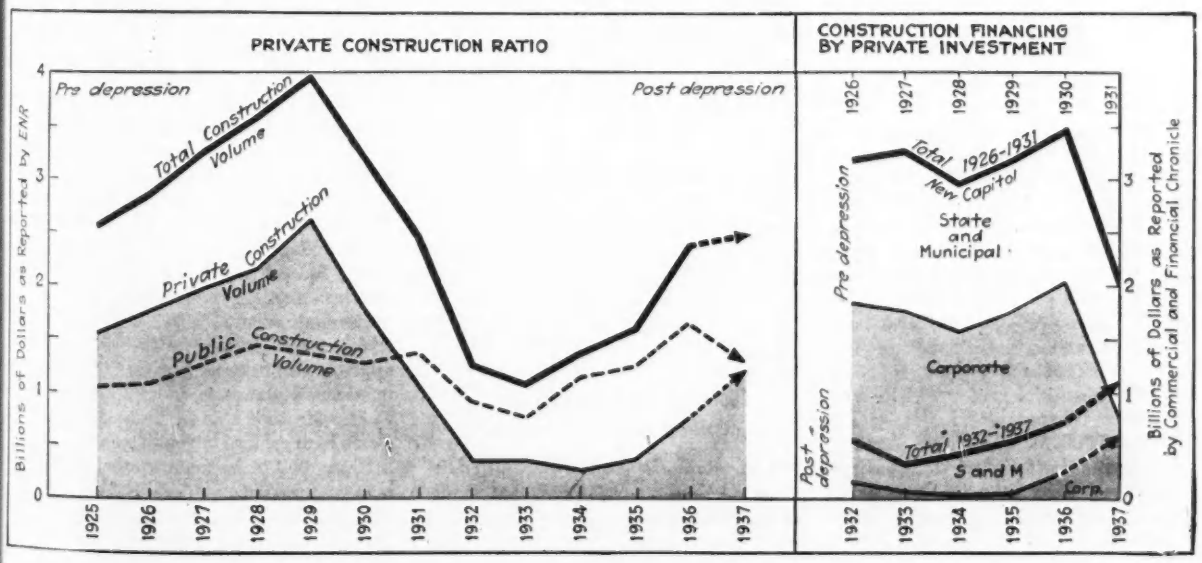
Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative. 1936 47 Wks.	1937 46 Wks.
NON-FEDERAL	$854,920	$1,349,899
State & mun. bonds	444,741	447,076
Corporate securities	233,438	494,758
PWA loans, grants	151,113	178,126
RFC loans	24,998	29,939
Fed. aid for highways	.....	200,000
FEDERAL	$691,237	$746,223
TOTAL CAPITAL	$1,545,527	$2,096,122

ENR INDEX VALUES

	Index Base	1913	1926
Construction Cost	(Nov.)	244.95	117.75
Construction Volume	(Oct.)	167	73



Colorado-Big Thompson Project Argued at Hearing

Use of national park area as tunnel route is attacked by conservation groups and park service

ROUTING of a 13-mile water tunnel, central feature of the Bureau of Reclamation's proposed Colorado-Big Thompson trans-mountain diversion project, under the lands of the Rocky Mountain National Park was attacked Nov. 12 by organizations interested in conservation and recreation as well as by representatives of the National Park Service. The attacks were made at a hearing on the project held by Secretary of the Interior Ickes.

Although it was generally admitted that the project as now planned would not seriously injure the park, it was argued that the project would provide a precedent for commercial exploitation of national parks and would lead to many demands for similar and less meritorious concessions. Fears were also expressed that after the project had been started it might be found necessary to construct a central shaft midway of the length of the tunnel within the park area. It was pointed out that construction of a 13-mile tunnel with a diameter of only 9½ ft. presents many practical difficulties which would be greatly decreased by the sinking of one or more working shafts and that a demand for this concession might be made after the work is under way.

There also was some fear that the tunnel, far below the present water table, may result in draining or injury to 23 small lakes within the park which lie over or near the tunnel line. Difficulties experienced with the nearby Moffat tunnel were cited to support this contention.

Power generation

The Colorado-Big Thompson project calls for the diversion of surplus waters from the west side of the continental divide through a 13-mile tunnel to the eastern slope where it will be used to provide additional water for 615,000 acres of developed land. Installation of power generating facilities in successive stages is also contemplated and would bring the eventual cost of the project to $44,000,000. The initial cost would include $24,666,000 chargeable to irrigation plus $7,037,000 for one power plant.

Arguments in favor of the project were presented by John C. Page, Commissioner of Reclamation, and by Senator Adams and Representative Taylor of Colorado. These speakers emphasized the fact that no part of the construction operation would take place within the park, since both portals of the proposed tunnel lie outside of its boundaries. They said that every effort would be made to prevent injury to scenic values by suitable design of buildings and terracing and planting of spoil banks. It was also argued that the water is urgently needed to protect from deterioration agricultural land assessed at $125,000,000 and supporting a population of 175,000. Possible alternative plans, it was said, show much higher cost and lesser power revenues.

Defenders of the project brought out that federal and state legislation establishing the Rocky Mountain National Park contains clauses reserving the right of reclamation interests to enter the area for construction purposes.

After hearing arguments on both sides, Secretary Ickes said that he was opposed in general to encroachments on park property for any purpose but that the present case was exceptional. Drawing attention to the restrictions embodied in the legislation establishing the park, he said that such restrictions were now prohibited in the establishment of new park areas but that their existence in this case could not be ignored.

The normal procedure in developing federal irrigation projects involves three steps: a finding of feasibility by the Secretary of the Interior, approved by the President; authorization by Congress; and the appropriation by Congress of construction fund. The present hearing was held to develop evidence to guide the Secretary in his feasibility finding, but the other two steps have already progressed considerably. The last session of Congress appropriated $900,000 to begin construction, although a bill authorizing the project failed to come to a vote in the House after passing the Senate; its early passage is anticipated.

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Shasta Dam Plans

(Continued from page 805)

and economic height have resulted in approval of the recommendation to increase the height.

Construction of Shasta Dam must await relocation of 37 miles of Southern Pacific R.R. trackage which is in the reservoir site. Negotiations to this end are now under way, and the Bureau of Reclamation hopes to start the relocation work early in 1938.

Shasta Dam, largest unit in the Central Valley project, will be supplemented by Friant Dam, another concrete structure, on the upper San Joaquin River east of Fresno. This dam will be 250 ft. high and 3,330 ft. long, with a storage of 45,000 acre-feet.

• • •

Insurance Is Taken On Gate Bridge

Insurance is being taken out covering risk to the Golden Gate Bridge, reportedly in the amount of $18,000,000. This action follows the example set in the case of the San Francisco-Oakland Bay Bridge, which was insured for $50,000,000 at the insistence of the Reconstruction Finance Corp., which desired protection for its loans on the bridge. The new policies bring to about $90,000,000 the amount at risk on bridges lying in the triangular tongue of land between the Hayward and the San Andreas faults, which converge in the valley south of San Francisco Bay.

Insurance on bridges is a rather recent development. It is believed that the George Washington Bridge was the first to be insured, and presumably RFC was influenced by the example of that bridge in its insistence on insurance for the Bay Bridge.

• • •

Wards Island Foot Bridge Proposed in New York

A foot bridge 790 ft. long, incorporating a 300-ft. lift span, to connect Manhattan Island with Wards Island in the East River, has been proposed to the city Board of Estimate of New York City by the Park Commissioner Robert Moses. Pointing out that residents of Manhattan would have to walk about three miles to reach the island across the Triborough Bridge, Mr. Moses said that a pedestrian bridge was essential if full value is to be obtained from the 177-acre park which is to be built on the island.

Mr. Moses' proposal was revealed in connection with a request for permission to purchase about $40,000 worth of land which would be used for the Manhattan approaches to the foot bridge. The commissioner's plan is to construct a bridge 15 ft. wide with a 55-ft. clearance above mean high water. It would consist of a lift span 300 ft. between towers, flanked by two fixed spans, each 245 ft. long. Access to the bridge would be given by long sloping ramps at either end.

Connecticut Judge Rules On Road Jurisdiction

The state highway commissioner of Connecticut and not the commissioner of public works has jurisdiction over construction and maintenance of Connecticut roads and the award of contracts, it was held in a Superior Court decision handed down Nov. 9 in an action on the State Attorney General's demurrer to an injunction suit brought by the Connecticut Rural Road Association. The court ruled, however, that the Rural Road Association had no right to maintain its action in court, since it failed to show that it would suffer a financial loss as a result of the allocation of highway work to the commissioner of public works.

The court held that design, construction and maintenance of state highways have been delegated by law to the state highway commission and that this delegation was not repealed by the act creating the public works commission and giving that agency control over all the "real assets" of the state.

The ruling is to be appealed immediately to the state supreme court as a test case. In the meantime, county-aid road projects are being handled by the state highway commission and bids for other road projects such as trunk lines and main highways are in the hands of the Commissioner of Public Works.

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Five-Ton Truck Limit In Lincoln Tunnel

Trucks of greater than 5 tons gross weight and trucks which cannot maintain a speed of at least 20 miles an hour on the exit grade will not be allowed to operate through the Lincoln (Midtown Hudson) tunnel while it is operating on a one-tube basis after Dec. 22. These restrictions will be removed when the second tube is opened, late in 1940 or early in 1941, and thereafter the tunnel will operate the same as the Holland Tunnel does now.

These rules were announced Nov. 10 by Billings Wilson, assistant general manager in charge of operations of the Port of New York Authority, in an address before the Metropolitan Section of the Society of Automotive Engineers.

Also excluded will be trucks propelled by diesel engines. This restriction was found necessary because of the danger of accident due to the dense black smoke which diesel engines occasionally emit and to the unpleasant odor of diesel exhaust. The usual restrictions against hazardous cargoes will apply.

The increasing tendency toward greater size of motor trucks led the Port Authority to make the Lincoln Tunnel roadway 1.5 ft. wider than that of the Holland Tunnel and also made it necessary to devise larger emergency equipment for the tunnel. Mr. Wilson said that an emergency truck now under construction will probably be the most powerful automotive wrecking unit in the world.

Washington Star Photo

COLLISION WRECKS BRIDGE IN VIRGINIA

A STEEL TRUSS highway bridge on Route 28 near Manassas, Va., fell Nov. 6 when a truss member was struck by a truck. The bridge dropped about 30 ft. into the water, but although the truck was partially submerged the driver was able to crawl out uninjured.

The bridge was a 110-ft. steel truss 12 ft. wide; it was built in 1904. The truck struck a compression member 36 ft. from the east end of the bridge, buckling the member.

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Building Stimulation To Be Tried

(*Continued from page 805*)

a time some form of operation embodying the economies of mass production may be evolved that will permit residence construction substantially cheaper than is now the case.

Members of the committee are: Robert E. Wood, president of Sears, Roebuck & Co.; Gerard Swope, president of the General Electric Co.; Henry C. Turner, president of the Turner Construction Co.; S. Sloane Colt, vice president of the Bankers Trust Co.; Edward F. McGrady, formerly Assistant Secretary of Labor and now associated with the Radio Corp. of America; Marriner S. Eccles, chairman of the Federal Reserve Board; J. Matthew Daiger, Federal Reserve Board; and Isadore Lubin, chief of the Bureau of Labor Statistics.

LABOR NOTES

In spite of a statement by the Electrical Workers Union that its members would not be allowed to work on the job, the trustees of the Chicago Sanitary District awarded the General Electric Co. the contract for building an incinerator at the Southwest sewage treatment plant. General Electric was the lowest of five bidders. A business agent for the International Brotherhood of Electrical Workers, A.F.L., stated that his union did not recognize the company as a bidder in the Chicago district and that none of his men would be allowed to work for any subcontractor employed by General Electric. He charged that the company employed non-union men in other cities. The trustees, pointing out that the contract on the $646,000 job, which is partly financed by federal funds, had received government approval, proceeded with the award of the contract.

In New York, an A.F.L. electrical workers group found itself in agreement with its employers as the union and the Consolidated Edison Co. of New York both entered suits in federal courts seeking to have set aside a National Labor Relations Board order handed down Nov. 11 which directed the Edison Co. to break its contract with the International Brotherhood of Electrical Workers on the ground that the company had discriminated against the United Radio and Electrical Workers of America, C.I.O. affiliate. The company was ordered to post notices to employees that they are free to join any union they choose, and the board ordered the company to end its alleged use of detectives to investigate labor organizations and to reinstate with back pay six employees said to have been discharged for union activities. Under existing contracts, the A.F.L. group holds exclusive bargaining privileges. Following the action of the N.L.R.B., the C.I.O. union requested the board to order an election among Edison employees.

Meanwhile, on Nov. 10, the C.I.O. group obtained a contract with the Tennessee Electric Power Co. covering 140 workers at the Hale's Bar and South Pittsburgh, Tenn., plants of the company. On the day following the agreement a general 5 per cent wage increase for about 2,300 employees was announced by company officials.

Union carpenters, electricians and truck drivers engaged on construction of a water softening plant at Warren, Ohio, went on strike Nov. 8, demanding that union labor be specified for the job.

The Kansas City, Kans. board of commissioners has rescinded its order (*ENR* Nov. 11, 1937 p. 572), directing the Swenson Construction Co. to stop work on the Montgomery Ward department store building there. The commission took this action after a hearing at which it developed that the labor dispute, which had given rise to the threat of violence leading to the original order, did not involve the issue of employment of local men. The Swenson Company, labor leaders said, was employing union men exclusively and local men in so far as they were available. The dispute had arisen from the fact that a sub-contractor was employing members of Local 498 of the truck drivers' union. The local is not affiliated with the Kansas City Building Trades Council and the council objected to the employment of the truck drivers. The dispute was settled by acceptance of Local 498 into the building trades council.

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More Pennsylvania Jobs Approved by PWA

Twenty-three more projects of the Pennsylvania general state authority, with an estimated total construction cost of $21,480,000, have been approved by Public Works Administrator Ickes. The PWA allotments for these projects include an outright grant of $3,305,000 plus a conditional grant of 133 1-3 per cent of the amount expended on wages for certified relief labor at the site of construction; the total grant cannot exceed 45 per cent of the cost of construction.

The projects which have been approved are part of the $65,000,000 state improvement program of the general state authority, which is being made possible by a PWA grant of $10,000,000 and additional conditional grants depending upon the amount of relief labor employed.

The largest project covers construction of buildings and facilities for Pennsylvania State College at a cost of $5,000,000. Buildings for the Pennsylvania State Tuberculosis Sanitarium will cost $4,765,000 and $1,151,000 is to be spent on buildings for the Danville State Hospital. The Scranton State Hospital will receive $1,042,000 worth of new buildings, and $2,645,000 will be spent on buildings for the Tuberculosis Sanatorium for Western Pennsylvania.

Total of 74 projects costing $58,877,000 now has been approved in the Pennsylvania program.

Nicaragua Asks Bids On Highways

Bids were called for by the Nicaraguan Ministry of Public Works on Oct. 28, to be submitted within 30 days, for construction of a highway system to include the Nicaraguan section of the Pan-American Highway, a highway "to the Atlantic Ocean" and "such others as the government may specify upon the signing of the agreement." The wording of the call is extremely vague, not only in describing the roads to be built but also in specifications and in the methods by which the contractor will be paid.

The government intends to set aside certain national revenue to be turned over to the contractor at monthly intervals so long as the work continues, any deficiency to be made up by treasury certificates of indebtedness to be amortized later. However, the sources of revenue will not be designated until the contract is signed, so that bidders have no knowledge of how much payment can be expected in cash and how much will be deferred until some later date.

The contractor must agree to furnish and pay for all materials and equipment, and must also renounce any right to diplomatic intervention in case of dispute. The government reserves the right to reject "or even to refuse to consider" any bid, and may also overlook any purely formal defect which may appear in a bid.

The roads will have a telford base and a surfacing of bituminous material. The Pan-American Highway is to be 8 meters wide, others 6 meters, or, when conditions of construction are difficult, 5 meters. Government inspectors are to have general supervision over design and construction of the highways.

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Registration Board Named In Michigan

A 7-man board of examiners to license architects, engineers and surveyors has been appointed by Governor Murphy of Michigan. The new body, appointed in accordance with an act of the 1937 state legislature, takes the place of an 8-man board which formerly carried out similar functions in the state of Michigan.

Members of the new board are Henry C. Anderson, Dean of the University of Michigan Engineering College; C. L. Allen, Michigan State College civil engineering department; Harry T. McGaughan; Lawrence G. Lenhardt, commissioner of public works of Detroit; Louis Kingscott; Andrew Morrison and Derrick Hubert, Sr., architects.

No Criminal Negligence In Sewer Accident

The blowout Nov. 2 around a shield operating in section 11 of the Detroit River Interceptor Sewer Tunnel in Detroit (ENR Oct. 7, 1937, p. 581) in which six men were killed and several others injured did not involve any criminal negligence, a coroner's jury investigating the accident found. The verdict reached by the jury after hearing testimony from Oct. 18 to Nov. 3 and visiting the scene of the accident was that "The six men met their death by reason of an accident caused by too much pressure being placed against the bulkhead in section 10 of the Detroit River Interceptor. There was no criminal negligence."

The accident occurred when the shield was within about 7 ft. of the end of section 11, where a junction was to be made with the completed and bulkheaded section 10. Failure of the bulkhead and of the intervening material under about 9 lb. of air pressure resulted in workmen being forced through the collapsed bulkhead.

A report was submitted to the jury by city engineer Thompson after an investigation by his department, and William H. Adams, in charge of WPA inspection, stated his findings to the jury.

The contractor on section 11 is the F. A. Healy Co., of Chicago.

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Floor of Old Building Fails in Oswego

The second floor of a 70-year-old two-story brick building in Oswego, N. Y. collapsed Nov. 3. One man was killed and two injured in the failure. The structure was built about 70 years ago and was being used as a vegetable packing plant by Allen W. Davis.

Investigation has disclosed no reason for the failure. At the time of the collapse about 5 tons of vegetables were stored on the second floor, whereas it is stated the floor had held 50 tons.

The building was a brick structure, and the second floor was supported by heavy wooden beams. The floor had been strengthened this past summer by the use of wooden posts.

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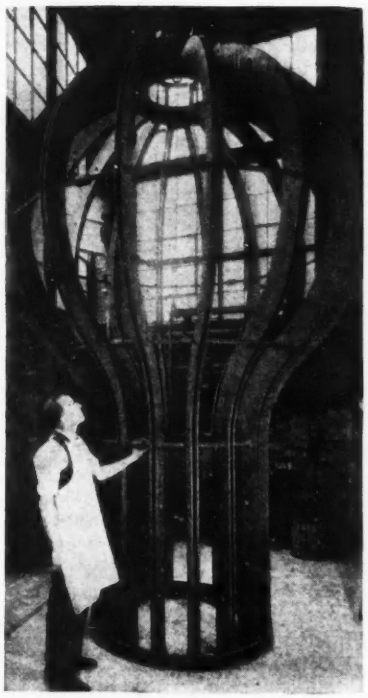
Technical Writing Course At Wisconsin

A home study course in the composition of technical papers, available to individuals anywhere, has just been added to the curriculum of the extension division of the University of Wisconsin at Madison. The course is described as especially adapted to the requirements of active technicians.



Corning Glass Works photo

A LIGHT FOR NEW JERSEY

A 14-FT. electric light bulb was completed early this month and will be placed at the top of the $100,000 Edison Memorial Tower now under construction at Menlo Park, N. J. The bulb, with a total weight of six tons, consists of a steel framework, shown above, over which more than 6,000 lb. of glass are fitted.

Water Hammer Studies At December Meeting

The subject of water hammer will be given broad treatment in a symposium to be held under the auspices of the committee on water hammer of the hydraulic division, American Society of Mechanical Engineers. The meeting is to be in New York City Dec. 8-9. Cooperating in the symposium are a number of other technical societies.

The symposium will be divided into three sections. At the first of these, at which Lewis F. Moody of Princeton University will preside, papers on the general theory of water hammer will be read. Water hammer in hydroelectric plants will be the subject of the second session, and Norman R. Gibson, vice president and chief engineer of the Buffalo, Niagara and Eastern Power Corp., will preside. Malcolm Pirnie, New York City consulting engineer will preside at the third session, which will be devoted to the subject of water hammer in waterworks systems.

High Wage Rates Set On Delaware Tunnel

Hourly wage rates in general far in excess of those now being paid in the New York City area for heavy construction work have been declared "prevailing" in Westchester County and will be the governing minimum scales on the first 20 miles of New York City's Delaware Aqueduct tunnel, for which bids were opened Nov. 9. According to law, the controller of the city must ascertain prevailing rates from the state Department of Labor and certify such rates for all municipal construction.

The Board of Water Supply, city department in charge of the aqueduct work, protested the high rates, but got no result. The board's engineers felt that the rates were excessive, especially in view of the long time contract commitments, 5½ years.

The extent of increases in the aqueduct rates is shown by comparison with scales established on the Sixth Ave. subway in New York. The following tabulation compares typical wage classifications on the aqueduct with those on Sec. 6 of the subway, for which contract was let only last April:

CLASSIFICATION	HOURLY RATES Aqueduct	Subway
General Engineering Construction		
Skilled:		
Blacksmiths	$1.625	$1.40
Bricklayers	1.715	1.50
Carpenters	1.50	1.40
Caulkers	1.525	1.15
Cement masons	1.715	1.40
Electricians	1.65	1.70
Back hoe operators	2.125	1.75
Compressor plant operators	2.05	1.50
Compressor (multiple portable) oper.	1.925	1.50
Compressor (single portable) oper.	1.75	1.50
Concrete mixer operators	1.75	1.50
Concrete paver operators	1.75	1.50
Concrete power hoists	2.125	1.50
Mucking machine operators	2.125	1.75
Crane operators	2.125	1.65
Derrick operators	2.125	1.65
Hoisting engineers (steel hoisting)	2.25	1.50
Keystone dipper operators	2.125	1.75
Locomotive operators	1.925	1.50
Pile driver operators	1.925	1.675
Shovel operators	2.125	1.75
Tunnel shovel operators	2.125	1.75
Mechanics	1.75	1.125
Metal lathers (reinf. setters)	1.75	1.40
Pile drivers	1.65	1.40
Plumbers	1.525	1.50
Sheet metal workers	1.50	1.40
Structural ironworkers	1.925	1.65
Timbermen	1.20	1.00
Semi-skilled:		
Blacksmith helpers	1.125	1.00
Chauffeurs (truck drivers)	.875	.75
Firemen or oilers	1.25	1.125
Plumber's helpers	.8125	.75
Ironworkers apprentices	1.25	1.00
Unskilled:		
Laborers	.75	.6875
Shafts and Tunnels in Free Air		
Blasters	1.875	1.65
Miners and drill runners	1.375	1.25
Miner and driller assistants	1.10	1.00
Laborers	.95	.80

News Continued on page 837

COMMENT AND DISCUSSION

Readers' opinions on matters that concern the engineer

An Added Responsibility

Sir: The recent interesting discussions regarding unions for engineers have had a tendency to becloud the real issue. Granted that there is a difference between the engineer and the lawyer or the doctor because the engineer deals with corporations more so than the lawyer. But that is not a valid reason, not even a good alibi, that the engineer should not have a strong professional organization.

Unquestionably the moral obligations of the members of the profession make it undesirable to adopt a union with all that it implies. But no engineer should object to taking over those attributes of unions which would be of credit to the professional organization. A strong union raises the living standards of its members. This should and could be done for the engineer by his society.

It is nothing unusual for an engineer to have a skilled laborer working under him receiving a larger wage scale; certainly not a credit to the profession. The American Society of Civil Engineers should do as much for the social and financial welfare of the member as it is now doing in the advancement of his professional knowledge.

R. JACCOUD FRANKLIN
Watseka, Ill. Oct. 31 1937

The F.A.E.C.T. Position

Sir: May I take this opportunity to answer the many pertinent points raised in an editorial in Engineering News-Record, of Oct. 21, p. 663, and further acquaint the engineer with the true nature of the F.A.E.C.T., its relation to organized labor, its objectives, its relation to the employer and the methods that our organization employs to attain its aims.

We wish to emphasize first of all, that we are an autonomous international union of the C.I.O. with the full right to determine our own policies and actions. As a democratic organization we abide by the decisions of our membership who formulate our policies and determine any course of action we may take. This should reassure the engineer that he will determine every action to take care of his interests. Our affiliation to the C.I.O. is a tremendous step forward for its means that we have the backing of 4,000,000 workers in attaining our objectives.

The objectives of the F.A.E.C.T. are best explained by our constitution which states:

The object of the federation shall be: (1) To advance and protect the economic welfare of all technical workers; (2) To strengthen the organization of technical workers and allied employees in a manner compatible with the most effective organization of all workers; (3) To secure for our members protection and full benefits of such patents and inventions as they may make; (4) To encourage the study of social and economic aspects of the professional activity both during training and subsequent practice; (5) To maintain civil liberties and democratic government; (6) To secure the enactment of legislation.

We ask all fair-minded engineers whether there is anything in our objectives that can in any way be misconstrued as being incompatible with the trustworthy and efficient performance of engineering functions. Our organization stems from the needs of the technical men for economic protection. This need has long been recognized, the professional societies discuss it but we are the only ones who have done something about it. Our increasing growth testifies to this.

Now as to our relations to the employers. The federation can emphatically state that it has in the past and will in the future adhere to any contractual agreement entered into with employers. In doing this we are carrying out one of the cardinal tenets of the C.I.O. It was at the recent C.I.O. conference in Atlantic City that the C.I.O. reiterated its stand on collective bargaining agreements in the following resolution in which the F.A.E.C.T. joined:

"RESOLVED that the C.I.O. expresses its firm policy as being committed to the determined adherence of its contract obligations and responsibilities. Employers who enter into such collective bargaining agreements will receive the complete cooperation and support of the unions affiliated to the C.I.O. in carrying through the full administration of such collective bagaining agreements."

The resolution is our unequivocal stand on agreements with employers. We can point to a growing number of agreements as ample proof of our carrying this into practice. We live up to our agreements.

Another word on this point. We consider an agreement to be individually as well as jointly binding. The planning engineer and the blue print boy both adhere to the terms of the agreement but we expect the employer also to adhere to the bargain he makes. If he does, no situation will be created which will interfere with the normal functioning of engineering operations. There will be no strikes.

The word that seems to haunt every discussion by employers of unionism is the "strike." It has been introduced primarily for the purpose of discrediting the union movement in the eyes of the engineer. In the four years of the F.A.E.C.T.'s existence we have had very few occasions to utilize the strike. We have achieved our objectives for the most part through negotiations. Only when the employer is clearly violating the law of the land as established by the Wagner Act and refuses to negotiate with us will the use of the legal practice of strike action be considered and democratically decided by the men involved.

LEWIS ALAN BERNE
President, Federation of Architects, Engineers, Chemists and Technicians, New York, N. Y., Nov. 5, 1937.

Mr. Berne has done probably as much as can be done by mere statements to clarify the points raised in our editorial of Oct. 21, but only time and action will tell whether the union has or can divest itself of the unfavorable character of a labor union affiliated with shop unions. For example, to claim that the F.A.E.C.T. is truly autonomous while it is receiving a $40,000 subsidy from the C.I.O. is to stretch credulity to the limit. It seems apparent that the C.I.O. is helping to strengthen the

federation for one reason, the basic reason in any labor-union movement, to have the help of a strong technical union when it needs that help. If some other C.I.O. union in an industry where the F.A.E.C.T. has signed up the technical men needs the support of these men, Mr. Berne knows that he will hardly have any alternative but to find an excuse for giving that support, and excuses are easy to find, as witness the epidemic of petty strikes in Detroit last spring. The resolution quoted by Mr. Berne may indicate a change of heart on the part of the C.I.O., but here again time alone will tell. To say that the F.A.E.C.T.'s strict adherence to contracts is evidence of its support of the resolution is yet without meaning because there are only a few such agreements and no one has been in existence long enough to be put to test. —EDITORS

Levees and Soil Mechanics

Sir: Your issue of Oct. 21, 1937, in commenting upon the joint meeting of the American Society of Civil Engineers and the Canadian Institute in Boston, Oct. 6-8, stated that I had expressed the opinion that the science of soil mechanics design can not accomplish much in aid of levee construction. My choice of language must have been singularly unfortunate to have conveyed such an impression. I am of the opinion that the science of soil mechanics can accomplish a great deal in the levee field.

It is true that the design of the standard levee cross-section used upon the lower Mississippi River was adopted and the main river levee system was pretty well along toward completion, before the comparatively new science had matured sufficiently in that department to lend much aid. And, since both analysis by the principles of soil mechanics and performance under stress of the 1937 flood have now indicated the adequacy of the cross-section in use, there would seem to be little point in modifying its general features at this late date. The science of soil mechanics has, however, been enlisted in the design of special cross-sections required at points of foundational weakness and is being increasingly relied upon to solve the problems that arise.

The fact that levees along the lower Mississippi were largely built before the science of soil mechanics was sufficiently developed to control their design is no reflection upon the general value of that science but is merely a consequence of its extreme youth. And the fact that an empirical design, adopted after many years of experience, checks out as correct when analyzed on the basis of soil mechanics, far from discrediting the science, lends added credence to its claims.

Experience is an excellent guide to design within its own confines, but when the problem is to build under conditions which depart materially from prior experience some additional criterion is obviously desirable. This the science of soil mechanics is, I believe, more and more dependably supplying, and thus is finally meeting a long-felt need which is currently more than normally acute by reason of the levee program engendered by the General Flood Control Act of 1936.

For various reasons which cannot be gone into in the space of this letter, levees as commonly built can hardly be designed with the precision possible in an earth dam. In the course of my discussion I pointed out some of the difficulties in this direction and discussed means of overcoming them. This was with a view to avoiding the pitfalls into which their disregard might lead the designer unacquainted with the more practical aspects of the problem, not with the thought of discouraging or in any way disparaging the idea of scientific design.

CHAS. SENOUR
Office of Mississippi River Commission
Vicksburg, Miss., Nov. 3, 1937

Specifications Are Followed

Sir: During a discussion among a number of engineers regarding the comments, "Specifications Not Followed," by C. J. Wilkin, *ENR*, Oct. 7, 1937, p. 585, the general consensus of opinion was that specifications for a given water content in concrete was, in general, followed closely. It has been my personal experience, during six years in direct charge of testing and inspection of over 800,000 cu. yd. of concrete placed in four navigation projects, that, not only was the specified water-cement ratio rigidly followed but that the contractors' superintendents on the various projects gave full cooperation in seeing that the specifications *were* followed. In fact, on more than one occasion, I have seen a superintendent instruct his concrete foreman to "dry up" the mix, without first being instructed to do so by an inspector. The superintendent realized that a wet mixture was no more economical to place than a dry one; that the happy medium was a plastic mixture of a consistency that would slide in the chutes (not flow) and drop in place with minimum segregation. Wet concrete segregates as readily as an excessively dry mixture.

It is believed that if the specifications are properly written, and intelligently interpreted by all concerned, good results will obtain without "the foreman turning the water loose as soon as the inspector's back is turned."

The writer could cite a considerable number of concrete projects of major magnitude where the specified water-cement ratio was rigidly followed. There may be contractors who do not intend to follow the specifications for water content in concrete, but I have yet to meet one who, after he has been shown the advantages to be gained through placing a reasonably dry mixture as against a sloppy one, was not only *willing* to follow the specifications, but insisted that his organization adhere to them.

Since all the qualities desired in a concrete structure depend directly on the water-cement ratio, I feel that the "theoretical fuss" over the amount of water entering the mix is fully justified. Further, I feel that the average specification writer can specify a water content which is consistent with the type of concrete desired, keeping in mind, of course, the characteristics of the constituent materials, and be reasonably certain that the specifications will be followed.

J. C. SPRAGUE
Huntington, W. Va., Nov. 9, 1937

Theme Building

Information as to the designers of the Perisphere and Trylon for the New York World's Fair given on p. 765 of our issue of Nov. 4 was incomplete. The firm of Weiskopf & Pickworth was retained only as consultant on the preliminary design. The actual design of the structure for which a contract has just been let is being made by the firm of Waddell & Hardesty; design of the foundations is by Moran, Proctor & Freeman, these firms having been retained by the World's Fair Corp.

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NOVEMBER 18, 1937

FALL RAINS are quite as likely as those of spring or midsummer to bring sharp downpours that tax the capacity of sewer systems. If the sewers are often overtaxed, as news paragraphs have to report after every such rain, it is a logical question whether enough thought has been given to weighing the cost of street and cellar flooding against the cost of sewer or drain enlargement. The main sewers of many growing communities are too small to carry the full discharge of all their branches and laterals, but only too often their enlargement is deferred until repeated flooding brings a compelling demand for action. Citizens properly ask whether such postponement saves as much as the losses experienced in two or three bad storms. The condition is easiest to correct in cities whose topography makes it possible to carry storm runoff along street gutters to natural outfall channels. But whether surface channels or sewers are the best means of relief, city engineers can benefit their fellow citizens by checking the storm drainage capacity before rather than after a flood.

Opportunity or Cash

AN APPLICATION for a job recently received at this office closed with the following statement: "Salary expected, just enough to get along." According to the professional union organizers, that attitude toward the cash compensation to be obtained from a job is one reason why pay is low in engineering; yet it is this setting of opportunity above cash compensation that distinguishes the young professional aspirant. The apprentice to a trade can learn to paint or lay bricks or run a lathe about as well on one job as another, but for the young engineer the character of the job on which he works has a definite value in experience and in the contacts that he makes. Therefore he measures only part of his compensation in dollars and is willing to accept a small money return if he can get high pay in experience. It will be argued, of course, that this sacrifice of money return is unnecessary, or should be, and possibly it is; but even under some more perfect economic system it is hard to believe that there will not still be young engineers, who, seeing that a few rise to positions of prominence while many remain in routine jobs, will not offer their services at bargain rates to get a foothold in a job that appears to them to offer an opportunity to step out ahead of the crowd.

What About Your Records

FEW ARTICLES on waterworks operation and maintenance tell so human and practical a story as does that by M'Kean Maffitt on p. 831 of this issue. Here is a tale by a water superintendent which convincingly proves the value of a valve record. It doesn't deal in gossamer generalities, but draws upon specific instances to show why things are done thus and so. The presentation is well adapted to make the reader appreciative of the detailed features of a workable system of maps and records. But this is not the sole purpose of the article; its prime function is to stimulate wider use of similar record systems elsewhere. Every water works man can see himself reflected in the mirror of situations held up for his inspection. If he wants to make his job easier and render better water service to the community, now is a good time to start that long-delayed valve record.

In the Wrong Direction

HIGH CONSTRUCTION COSTS are recognized as an unfavorable factor in the construction outlook, and last week the President pointed to them as one of the deterrents to progress in residential construction. Conditions of today plainly call for a halt in the continuous upward trend of construction wage rates. But examination of the rates set for the first tunnels of the Delaware River Aqueduct of New York City's new water supply indicates that the trend continues upward at sensational pace. Most of the skilled rates for the tunnel work, cited by the State Labor Department as "prevailing" and under the law therefore mandatory, are set at $2.12½, though corresponding rates now paid on subway construction in New York City, determined by the same department only last April, are $1.65 and $1.75. Thus, under the new determination, labor will be paid more in the suburban areas than it is getting in the heart of the city. The new rates are all the more surprising because of the long duration of the construction contracts, five-and-a-half years. It may be held that since the tunnels are to be built from public funds there is less reason for concern over high labor costs; but what about private construction that is sure to be adversely affected by these unprecedented rates? The day's need is stimulation of construction, not further discouragement, and labor in its own interest should be the first to recognize this fact.

Good News on Housing

SPURRED on by anxieties awakened by the unseasonable sag in business, business men and public officials alike are finally coming to see that housebuilding provides one of the greatest untapped reservoirs of business that has ever been allowed to accumulate in this country. And, chastened by the cost rise in labor and materials that stemmed the growing tide of construction during the first half of the year, they are now seeking ways and means to keep costs down to a level that will not scare the customers or, in the case of public housing, the taxpayers.

Most encouraging is the changed attitude in Washington toward the part that private business can play. The President himself voices unexpected sympathy for the problems facing private builders; indeed, he goes beyond mere sympathy, for he is actively seeking means to aid them. So far he has mentioned the need for lower interest rates and for decreased construction costs, suggesting for one thing an annual wage for building mechanics in order to lower the high hourly wages. Granting the difficulty of putting either of these needed reforms into practice, recognition of their desirability is an important step.

A second piece of cheering news originated in the meeting of the National Public Housing conference in New York last Saturday, when Louis H. Pink, chairman of New York State's Board of Housing, urged and the meeting indorsed state loans to limited-dividend corporations who would undertake large-scale slum clearance housing. No more constructive program can be followed than the encouragement of private capital to invest in housing through such corporations. The Federal Housing Administration recognized this truth last week when it raised the permissible dividend rates of such companies from 6 per cent to 8 per cent. Constructive action along these lines will in the end do more for housing—social housing as well as all other kinds—than any amount of public housing that the nation can afford.

Finally, in the inauguration of the U. S. Housing Authority under Administrator Nathan Straus there is cause for optimism. He has already given promise of getting down to cases and aiming straight at the goal of building publicly-financed housing at costs proportionate to ability to pay on the part of the low-income group. Such a realistic view has been lacking from the housing efforts of the past few years. Five-thousand-dollar housing is too expensive for fifteen-hundred-dollar workers. The Resettlement Administration made even greater investment in its Greenbelt villages, and PWA was unable to get below $6,000 per family except in some of the small developments in the South; in New York City it came nearer to $10,000. It is not strange under these conditions that public housing has made absolutely no headway against the deplorable housing conditions of our lower income groups. If Mr. Straus' realistic view can be steadfastly maintained and consistently carried into practice, it will be valuable not only through the housing directly provided by public authorities but quite as much through the example set to private housing enterprise.

All of these developments constitute cheering housing news. After five years of muddling, we may finally be on the road to a consistent and workable housing policy.

Into New Fields

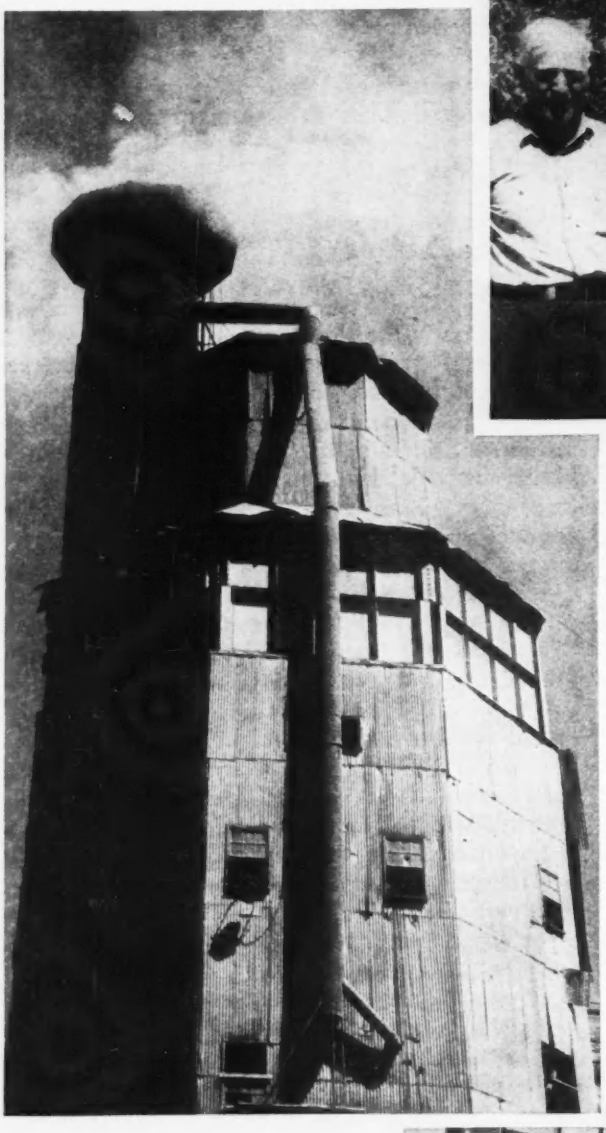
PUBLIC WORKS occupy a specially prominent position in the President's opening message to Congress, delivered last Monday, because a recommendation concerning them is the most definite item of the entire message. The President is vague in his hope for stimulating private investment, in his wage-regulation suggestions and in his farm program. As to public works, however, he very definitely, and for the second time, advocates systematic planning, in tangible terms.

He asks that the country be divided into seven regions and that all proposed works in each region be appraised and coordinated by a regional group. Though seven appears a small number to reflect the many differences in climate, resources and development within the forty-eight states, the number is of negligible importance compared with the general scheme and purpose. The purpose, conservation and best use of our natural resources, is fundamental and will meet universal approval. Abandonment of sporadic spending "on a project here and a project there" will also be endorsed, especially by those who recall Fort Peck, Quoddy and the Florida Canal.

It will be agreed by all that comprehensive study and planning of national public works point the way forward. The question, if any, is as to the feasibility of the method. Can proper coordination and well-weighed selection of projects for national development be obtained through the judgment of local groups? Unless the recommendations of these groups are sufficiently convincing to be proof against popular demand and political preference, the Regional-Board system may confuse rather than help. Again, can future conditions and needs be foreseen clearly enough to make planning for the far distant future possible? If not, even careful planning may in fact be poor planning—and poor planning may be worse than empirical selection. But the system has undoubted promise. It ought to be tried.

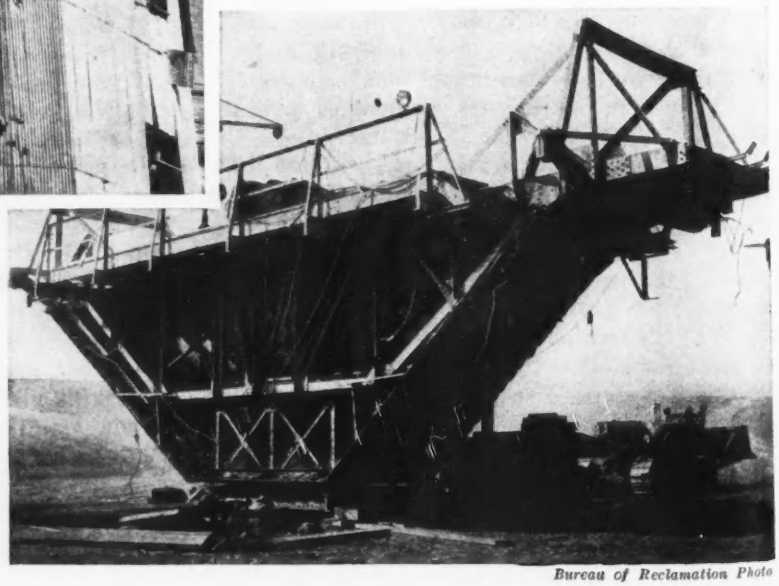
PICTURES IN THE NEWS

ENGINEERS RESPONSIBLE FOR SEMINOE. *(left to right) W. J. Rohan, Supt., Winston Bros. Construction Co.; J. H. Warner, resident engineer, U. S. Bureau of Reclamation; Verne L. Peugh, chief engineer, Winston Bros.; H. W. Bashore, construction engineer, U. S. Bureau of Reclamation. Mr. Warner is author of the Seminoe Dam story which begins on the opposite page.*



HUGE CONCRETE MIXER. *This is one of two plants that combine cement with sand, gravel and water to provide nearly 8,000 cubic yards of concrete for Grand Coulee Dam during the 24 hours of every day.*

CANAL LINING MACHINE *in use on the Yakima-Ridge Canal of the Roza division of the Yakima project, being moved by bulldozer and trailer from one section of the canal to another.*



Bureau of Reclamation Photo

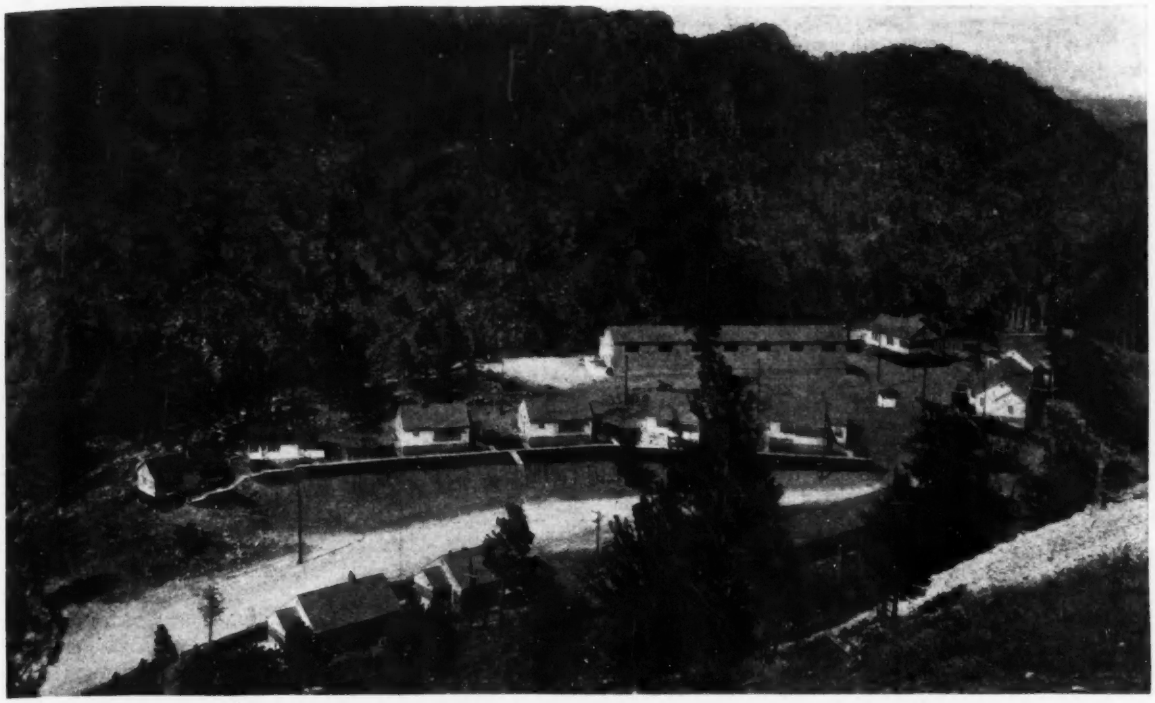


FIG. 1. THE GOVERNMENT CAMP IS IN ONE OF THE SIDE VALLEYS CLOSE TO THE DAM SITE.

Seminoe Dam Progress

by J. H. WARNER

Resident Engineer, U. S. Bureau of Reclamation, Seminoe Dam, Wyo.

River diversion permits start of construction on the dam itself after eighteen months of preparation work in remote and rugged canyon

DIVERSION of the North Platte River on Aug. 10 through the recently completed diversion tunnel at the Seminoe Dam marked the culmination of the long and difficult period of preparation for the start of work on the structure itself. Located in one of the least accessible canyons of the river, 73 miles from Casper and 37 miles from Parco, the nearest railroad connection, the Seminoe Dam and power plant is a part of the Kendrick (formerly Casper-Alcova) Project, which will provide 1,000,000 acre-ft. storage of flood waters and will produce 150,000,000 kw.-hr. of power annually.

During the preparation period the following items have been fully or partially completed: Camp with utilities for 400 men, roads, aggregate and mixer plant, excavation of the horizontal and inclined spillway tunnels, diversion tunnel, concrete lining of horizontal spillway and diversion tunnel and partial lining of the inclined spillway tunnel, stripping and trimming for abutments, tailrace excavation, partial curtail-wall grouting and, finally, the upstream cofferdam which permitted the Aug. 10 diversion. A description of the design, concrete mixing plant, cableway and aerial tram to the aggregate producing plant 4½ miles upstream appeared in *ENR*, March 18, 1937. There follows progress to the time of diverting the river.

For the purpose of providing quarters for operators after completion of the dam and power plant a permanent camp was constructed by contract and government forces. The contractor erected all buildings while the government forces constructed the domestic water and sewage systems, electrical distribution system and service roads.

The government camp, located 1½ mile by road and 600 ft. above the dam, consists of a structural steel and concrete warehouse, 53 x 140 ft. in plan, served by a 10-ton electric traveling crane, a reinforced concrete garage and shop, frame constructed office building and testing laboratory, a 12-room dormitory with garage space and nine standard U. S. Bureau of Reclamation type residences, three 5-room, four 4-room and two 2-room houses. These houses are fully insulated for permanent occupancy. The buildings were con-

tracted to Dutton, Kendall and Hunt, of Denver, Colo., and were all completed in August, 1936.

The water and sewer systems built by government forces constituted the major operation during the spring and summer of last year. Due to the rocky terrain and the severe winters it was necessary to excavate to a minimum depth of 6 ft. in solid rock for all pipe lines. A 2½-in. line was laid from collecting galleries to the storage tank and a 4-in. line from the tank to the buildings and fire plugs. Both lines are of steel pipe with slip-joint couplings. The water-collecting system consists of a five-compartment, reinforced concrete collecting gallery built on the bedrock of Morgan Creek, 2,400 ft. distant from and 600 ft. below the storage tank. These galleries, which are 10 x 15 ft. in cross section and 60 ft. long, collect the underflow of this creek and furnish all domestic water needed for the government and contractors' camps. The supply is pumped to a covered circular reinforced concrete tank of 50,000-gal. capacity, 30 ft. in diameter and 10 ft. deep, buried in the rock on a hill that separates the government and contractors' residences. A float switch in the storage tank controls automatically the operation of a 3-x 5-in. horizontal duplex 50-g.p.m. pump powered by a 15-hp. motor.

A reinforced concrete septic tank was constructed in a small rocky canyon, ½ mile from camp, for the treatment of government camp sewage only. Water and sewer lines were laid in the bottom of the same trench with the latter of 4 and 6-in. tile sealed with mastic.

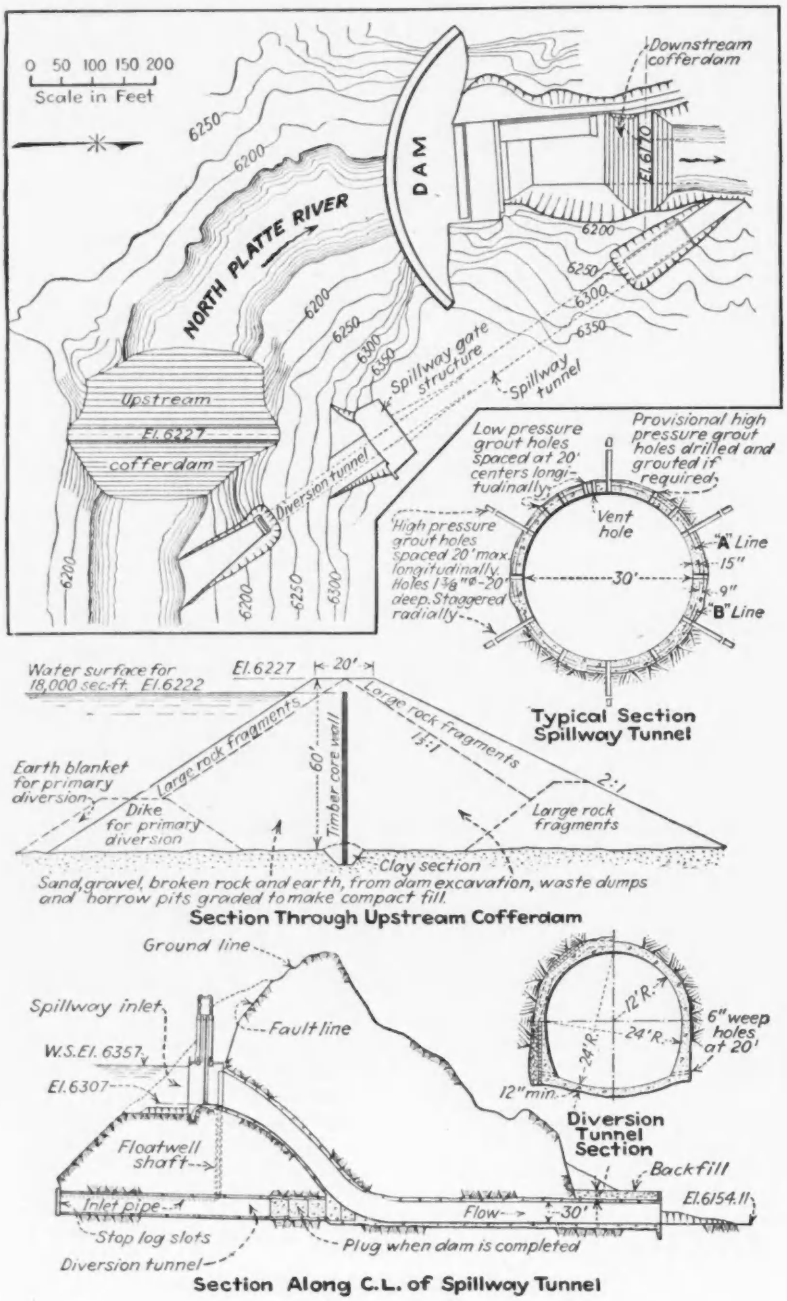


Fig. 2. The diversion tunnel at Seminoe Dam has been completed and the cofferdams are under construction.

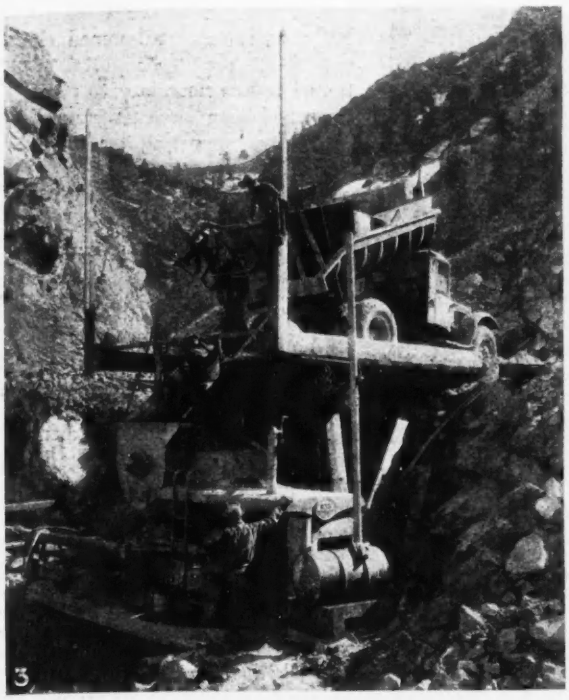
Contractor builds camp

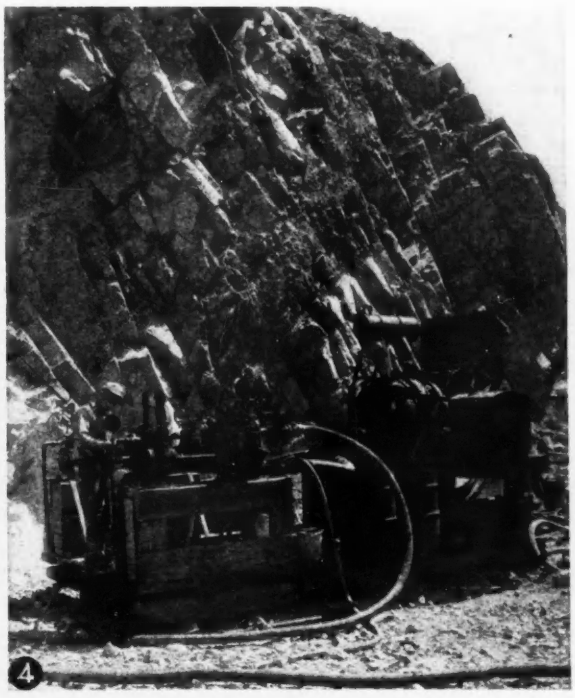
In addition to ten residences built by the contractor for his foremen and officers near the government camp, he has constructed, at the confluence of Morgan Creek and the North Platte River ¼ mile below the dam site, a construction camp for the housing of four hundred men.

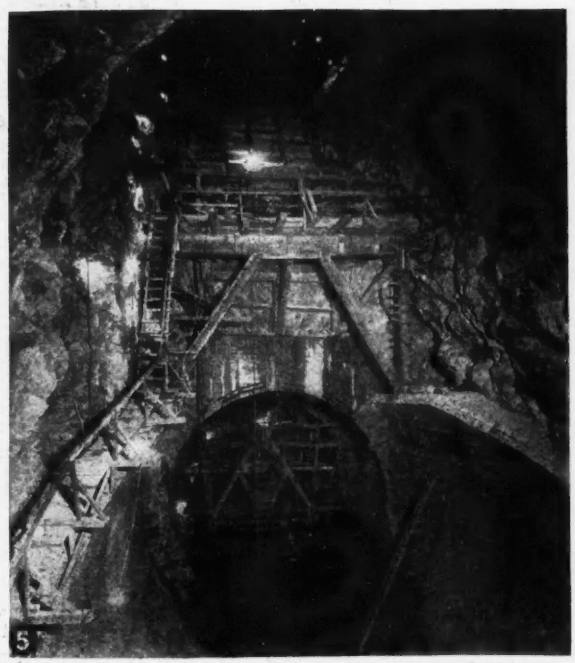
The government camp, being situated on a rocky hill, with little soil, necessitated the removal of a large quantity of rock for the construction of service roads. Also many cubic yards of top soil were hauled from Pole Creek previous to planting lawns and building concrete walks and steps. Instead of hauling away all the loose rock several dry rock walls were laid, enhancing the beauty of the grounds. For recreational purposes a tennis court and an outdoor fireplace for picnics were constructed within the camp area.

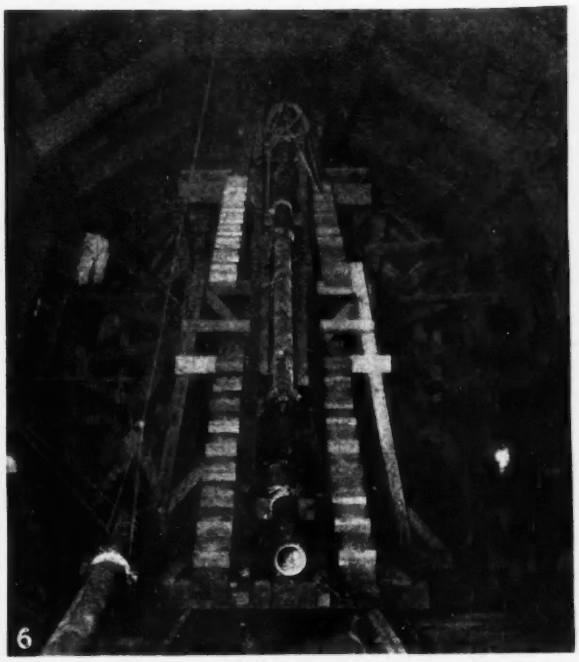
A small building has been erected in a central location to house the fire hose cart. Fire plugs being within 100 ft. of any permanent camp building, and a generous supply of fire extinguishers within easy reach, the protection system was recognized by the Fire Underwriters Board as being completely adequate to the point of reducing the premium rates on household goods in the government houses to $0.34 per $100.

A 2,300-volt, 3-phase, transmission line, 2,500 ft. in length, extends from the Seminoe sub-station through camp to the pump house at Morgan Creek. Virtually all pole locations were unavoidably in solid rock, requiring drilling and blasting in ex









Figs. 3-6 Diversion tunnel construction. (3) Cramped quarters for the concrete pump. (4) Grouting sled with duplex pump and small mixer. The clay seam in the back of this picture dips under the spillway gate structure. (5) Looking into the plug section of the tunnel and up into the spillway incline. (6) Rear of the form jumbo showing the pipe for pumping concrete into the top form.

cavating the holes. Distribution to the residences and buildings is at 230 volts, with a 115-volt connection to the neutral wire for lighting. This permits 230 volts for the electric ranges now in the residences and the possible installation of electric heating units at some future time. The electric crane installed in the warehouse requires a separate 3-phase, 230-volt circuit and transformers, in addition to the lighting circuit. A similar service was made to the office building from the same transformers for the concrete testing machine in the field laboratory which is located in the basement of the office.

Actual construction was started by the general contractors, Morrison-Utah-Winston-Lawler Co., under the supervision of Winston Bros. Co. of Minneapolis, on Feb. 20, 1936, by the removal of a talus slide at the damsite. This preliminary excava-

Fig. 7. **Plug-section invert showing the grout tubing (white). Outlet boxes are under 6 x 6 in. timber in the bottom and under 2 x 6 in. planks at the quarter points.**

tion not only furnished some much needed space in the canyon but also provided fill material for the camp and shops area, mostly in Morgan Creek canyon which has been filled in 50 ft. or more. The usual small run-off is carried in a culvert at the bottom of the fill but larger flows are quickly absorbed in the rocky, porous material.

Tunnel and rock cut work

Excavation of the horizontal and inclined spillway tunnels and the diversion tunnel, a continuation of the former, required the remainder of the year to complete. Carried on simultaneously with the tunnel driving was the removal of 50,000 cu.yd. of inlet and outlet open rock cuts for the spillway.

The desirable progress schedule was one that enabled the concrete lining to be placed in the spillway tunnel in the fall of 1936 and the river diverted shortly thereafter, but late in the summer this program was found to be impossible to meet. Two serious delays were encountered, the blocky character of the granite at the spillway outlet and later the decomposed rock found in 200 ft. of the diversion tunnel. In consequence it was decided to delay the tunnel lining until the spring of this year and endeavor to divert the river in July, 1937. As noted the diversion was made on Aug. 10.

The horizontal section of the spillway tunnel is a 30-ft. diameter concrete-lined bore, and the diversion tunnel was to be any size, either lined or unlined, elected by the contractor. It discharges into the spillway tunnel at the junction of the inclined shaft. The terms of the contract provided payment for the cofferdams and diversion tunnel at a lump sum bid. The contractor chose to design for a maximum flood of 18,000 sec.-ft. with a resulting 27-ft. unlined horseshoe-shaped tunnel. After tunneling the full section of the diversion bore through 30 ft. of sound granite from the upstream portal a mass of disintegrated granite material with numerous mud seams was encountered for 130 ft. requiring heavy timbering consisting of 12x12-in. sets at 4-ft. centers. It was necessary to proceed with wall-plate drifts at the spring lines, setting one arch segment at a time, followed by plumb posts. The progress in the timbered section was so slow, less than 4 ft. per 24 hours, that the postponement of river diversion previously noted was adopted. Also favoring postponement was the fact that the bad rock encountered made lining of the diversion tunnel necessary to insure the stability of the spillway gate structure above it.

The top half of the spillway tunnel was removed first by means of a drill jumbo carrying six water drills and a mucking machine loading 4-yd. dump cars operating on parallel tracks and hauled by a storage battery locomotive. The bottom half from the spring line down was excavated using a drill jumbo, built on a truck body, and a short boomed electric shovel. At the lower portal of this tunnel it was necessary to place sixteen steel beam arch rings welded in place for supporting the roof to a point 70 ft. underground. When the inclined tunnel location was reached a 6x10-ft. stope was started up the center line. The enlargement of the inclined spillway tunnel was done by drilling and blasting out the top half and proceeding down, allowing the material to slide down the 50-deg. pilot shaft where it was loaded into trucks. The portion below the spring line was removed with jackhammers starting at the bottom of the incline and working back up the tunnel.

Spillway inlet cut

A series of shear planes, having a dip of over 50 deg. and strike practically paralleling the exposed rock face, is intersected by the center line of the spillway inlet at an angle of 45 deg. These conditions, as observed in the test drifts, warranted the removal of a slab, 20 ft. thick over the entire area of the cut before the ¼:1 excavation was started. The excavation of the inlet cut and for the spillway gate structure which is an enormous opening upon the right abutment about 200 ft. high and 56 ft. wide proceeded steadily to the end of the year, except for one month, Oct. 15 to Nov. 15, when the crews were all working in the inclined tunnel. As the year closed the inlet cut was complete except for trimming. Some overbreakage occurred in this cut, even back of the fault plane. Some 30,000 cu.yd. of rock was removed from the cut.

Extension trestle erected

In August of this year an extension trestle was erected in the spillway gate chamber space from which to drill and grout the rock face. Concrete lining in the diversion tunnel, plug section and horizontal portion of the spillway tunnel were completed a short time prior to the river diversion. Low-pressure grouting was completed before diversion in all tunnels except the diversion end. All concrete in tunnels was placed by pumping into alternate 20-ft. sections of invert, sidewall and arch. Jumbos for forming the sidewalls and arch were built to travel on standard gage track.

The invert of the horizontal section was top-formed near the quarter points in order to permit thorough vibration of the concrete. These forms were stripped within an hour and then trowelled. The invert of the inclined spillway tunnel has been formed; both top and sides throughout and several sections of the completed lining of sides and arch are now in place.

Stripping and abutments

The stripping of the canyon walls of loose material and detached masses of rock that might endanger life or structures below has been carried along with the abutment excavation, as well as the removal by the contractor of 28,000 cu.yd. of rock in his cableway benches located 65 ft. in elevation above the crest of the dam.

The actual rock excavation of dam abutments did not start until September, 1936, and was carried on intermittently for two months at the left abutment. Due to the narrowness of the floor of the canyon at the damsite it was impossible, until some material had been removed from each side, to maintain truck roads through the site. As this work advanced and more room was obtained roads were used on both sides of the river thus speeding the work.

During a 6-week period early in the winter, and after disintegrated material had been encountered in the diversion tunnel, it was considered advisable to further investigate the quality of the rock deep in the abutments to prove if conditions existed there that were not revealed in the early investigations. The original exploratory work included many drifts, shafts and about 2,000 ft. of diamond drill holes.

This additional testing work consisted of driving five 5x6-ft. drifts into the abutments, four in the right and one in the left abutment at various elevations. A total of 450 lin. ft. was excavated, some drifts at depths more than 100 ft. from the face of the cliffs, to prove the non-existence of any weakness in the rock well back of the designed excavated abutment lines. It was decided that with some additional filleting of the arch, the abutments were entirely adequate for the projected arch loads. One of these drifts connects with the spillway tunnel at the foot of the inclined section. From it a grout curtain will be extended from the river bed to the diversion tunnel. Late in December of last year work was resumed on the abutments shaping the keyway to the designing profile. Some 138,000 cu.yd. has been removed from the abutments.

Tailrace excavation difficulties

The tailrace as designed and now completed begins at a point 2,200 ft. downstream from the power house. It is a 70-ft. bottom width channel with 1:1 side slopes, set on a slope of one foot to the thousand. It has been a difficult piece of excavation due to the number of large boulders buried in the sand, gravel and talus. The majority of the material was removed by a 5-yd. electric dragline with an 80-ft. boom, loading into 10-yd. trucks, which hauled to waste, banks up Morgan Creek. The yardage was 144,000, of which 12 per cent was rock larger than 1 cu.yd. and had to be shot. The plan of attack adopted was the building of a road far enough into the river bottom for the dragline to reach the slope stakes on the opposite side and excavate a deep waterway previous to the majority of drilling. Very little ledge rock has been encountered but all rock of such size that it could not be handled economically was drilled and shot.

Three access roads are being constructed in the canyon, one benched in the rock leading from the present road west of the tailrace and dropping down to the power house. The longest road will be about 2,300 ft. leaving the present road in Morgan Creek following along the side hill through a saddle and thence to the top of the dam through heavy rock cuts. It will be necessary to remove one cliff near the dam which contains 17,500 cu.yd. The third road from the east end of the dam to the spillway gate structure is located on the sheer cliffs and is designed with a cross section of half bench and half rubble masonry wall.

Construction plant

A vast amount of preparatory work has been accomplished by the contractor, namely: The building of shops and warehouse, the stock piling of 100,000 cu.yd. of concrete aggregate in raw storage at the screening plant, the completion of the aggregate processing plant, the erection of loading bunkers and a 2½-mile aerial tram line from the screening plant to the mixing plant, the assembly of a 3,800-bbl. steel cement silo and cableway from silo to mixing plant, the construction of the concrete mixing plant and the installation of a 12-ton traveling cableway spanning the canyon. For description of the contractor's plant see *ENR*, March 18, p. 399.

The mixing plant is equipped with one 4-yd. tilting mixer, driven by a 75-hp. motor. A watt meter for measuring and recording concrete consistency is installed with the mixer drive motor. All recording instru-

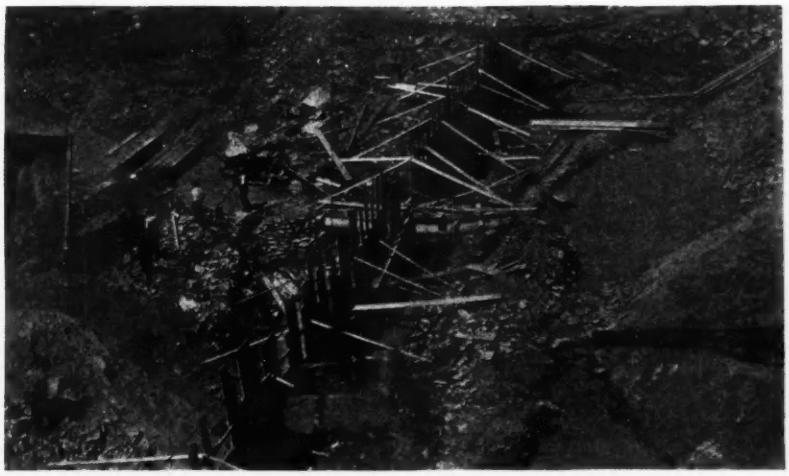


Fig. 8. The cutoff wall of the upstream cofferdam is to be two layers of 2 x 12 in. dressed plank with 12-oz. canvas between the layers.

ments are of the strip type, with standard 5½-in. width charts and radial pens. The speed of the aggregate, cement, water and consistency charts are all 30-in. per hour with ½-in. subdivisions, representing one minute. This speed is used to allow the use of accumulative weighing in the main batcher, thus making the charts more legible. The concrete is transported from the mixing plant in 4-yd. rectangular bottom-dump buckets carried on a flat car. An 8-ton locomotive moves this car over a standard gage shuttle track to a point under the cableway spanning the canyon. All concrete in the dam and power plant will be placed by the cableway. Concrete in the tunnel lining and spillway gate structure is being placed with an 8-in. concrete pump.

Progress schedule

The latest construction program anticipates the placing of all concrete tunnel lining and the completion of the spillway gate structure this season, as well as finishing all rock work on abutments, and partial excavation in the canyon floor for the dam and power plant. To hold to this schedule, which so far has been substantially met, required that concrete lining in the tunnels, except the inclined tunnel, be placed by July, the cofferdams finished and river diverted soon after this date. Placing of mass concrete in the dam will require a minimum of 12 months, beginning in March, 1938 and completed in June, 1939. The rate of placing is regulated to 5-ft. lifts in any one panel every 72 hr., and the difference in elevation between any two panels at no time more than 10 ft. If this schedule is adhered to, power plant machinery will be installed early in 1939.

Personnel

Seminoe Dam is being constructed by the U. S. Bureau of Reclamation, of which John C. Page is commissioner. All engineering and construction of the Bureau is supervised by R. F. Walter, chief engineer, S. O. Harper, assistant chief engineer, and J. L. Savage, chief designing engineer, located at Denver, Colorado. H. W. Bashore, with headquarters at Casper, is construction engineer for the Kendrick Project and the writer is resident engineer.

Designing Piers on Piles To Resist Ship Impact

by PAUL ANDERSEN

Assistant Professor of Structural Engineering, University of Minnesota, Minneapolis

Bending moments and stresses determined by formulas based on kinetic energy of approaching vessel

SHIPS must approach piers and wharves at very low speeds in order to avoid damage to their hulls and to the waterfront structures themselves. While collision between a ship and a structure of the gravity-wall type will not, as a rule, result in any injury to the wharf, since the energy will be dissipated in the large mass of concrete and fill, in the case of a structure supported on piles the energy of the moving vessel must be absorbed by the elasticity of the structure itself. Stresses then are set up and must be accounted for.

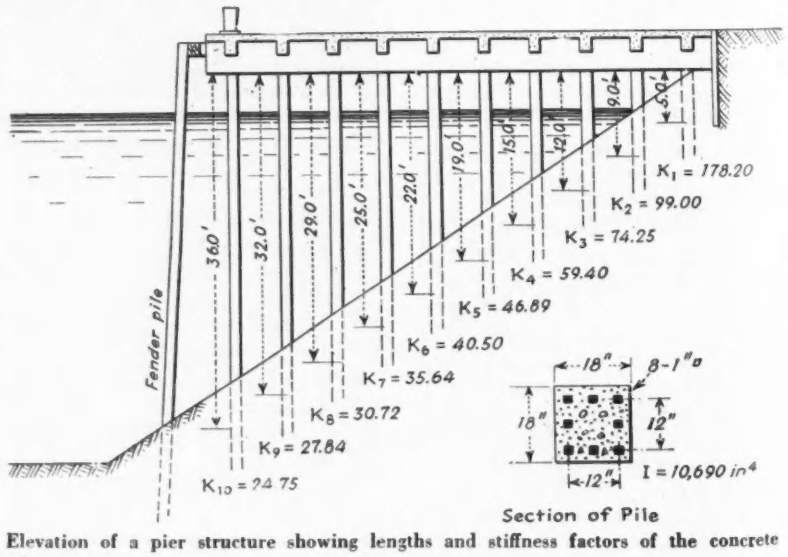
In orer to make allowance for this impact most piers and wharves are designed for an arbitrary horizontal force in addition to dead load, live load and lateral earth pressures. There is presented here a procedure for expressing the stresses in structures on piles as functions of the kinetic energy of the approaching vessel. The analysis can easily be extended to substructures consisting of caissons or combinations of caissons and piles.

The following notation is used:

$P_1, P_2, P_3, \ldots =$ system of equivalent static forces.
$E =$ modulus of elasticity—lb-per sq.in.
$M =$ maximum bending moment in pile.—in.-lb.
$N =$ number of bents sharing impact of ship.
$W =$ displacement of ship—lb.
$l =$ unsupported length of pile—in.
$K = I/l$; stiffness of pile—in.^{3}
$l =$ unsupported length of pile—in.
$g =$ gravity acceleration—386.4 in. per sec^2
$v =$ velocity of ship—in. per sec.
$\Delta =$ top deflection of pile bent—in.

Derivation of formulas

A moving ship contacting a wharf such as is shown in the accompanying illustration, will cause horizontal deflections of several pile bents and will come to a standstill when its



Elevation of a pier structure showing lengths and stiffness factors of the concrete pile supports.

total kinetic energy has been converted into strain energy of the deflecting bents. The total strain energy of a bent can be written as the sum of energies stored in each pile. If the piles are assumed fixed at points below the ground line and fixed-free at the pile cap, it is seen that:

$$\frac{P_1^2 l_1^3}{24\,EI} + \frac{P_2^2 l_2^3}{24\,EI} + \frac{P_3^2 l_3^3}{24\,EI} + \cdots\cdots = \frac{1}{N} \times \frac{W}{2g} \times v^2 \quad \text{.....(1)}$$

Assuming equal deflections of the tops of all piles,

$$\frac{P_1 l_1^3}{12\,EI} = \frac{P_2 l_2^3}{12\,EI} = \frac{P_3 l_3^3}{12\,EI} = \cdots\cdots \quad \text{.....(2)}$$

$$P_2 = P_1 \frac{l_1^3}{l_2^3}, \quad P_3 = P_1 \frac{l_1^3}{l_3^3}, \quad \text{.....(3)}$$

Substituting (3) in (1),

$$\frac{P_1^2 l_1^3}{24\,EI} + \frac{P_1^2 \frac{l_1^3}{l_2^3}}{24\,EI} + \frac{P_1^2 \frac{l_1^3}{l_3^3}}{24\,EI} + \cdots\cdots = \frac{1}{N} \times \frac{W}{2g} \times v^2 \quad \text{.....(4)}$$

$$\frac{P_1^2 l_1^3}{24\,E K_1^4} + \Sigma K^3 = \frac{1}{N} + \frac{W}{2g} + v^2 \quad \text{....(5)}$$

If

$$C = v\sqrt{\frac{3\,WE}{N\,g\,\Sigma K^3}} \quad \text{.....(6)}$$

then

$$M_1 = \frac{1}{2} P_1 l_1 = C K_1^2$$

$$M_2 = \frac{1}{2} P_2 l_2 = C K_2^2$$

$$\cdots\cdots\cdots \quad \text{.....(7)}$$

It is seen that the maximum bending stresses will occur at the top and bottom of the rear pile and are directly proportional to the velocity of the moving ship and also directly proportional to the square root of the displacement.

In case of a timber platform supported on timber piles, the latter should be assumed hinged at the top and (5) becomes,

$$\frac{P_1^2 l_1^2}{6\,E K_1^4} \Sigma K^3 = \frac{1}{N} \times \frac{W}{2g} \times v^2 \quad \text{.....(5a)}$$

and the maximum bending moments are,

$$M_1 = P_1 l_1 = C K_1^2$$

$$M_2 = P_2 l_2 = C K_2^2$$

$$\cdots\cdots\cdots \quad \text{.....(7a)}$$

where C is given by (6).

The deflection of a pile bent caused by the complete absorption of the kinetic energy is in case of piles fixed at the top and bottom

$$\Delta = \frac{P_1 l_1^3}{12\,EI} = \frac{C\,I}{6\,E} \quad \text{.....(8)}$$

If the piles can be assumed hinged at the top, the deflection of a pile bent is

$$\Delta = \frac{P_1 l_1^3}{3\,EI} = \frac{C\,I}{3\,E} \quad \text{.....(8a)}$$

Of the quantities involved in computing the stresses and deflections, the unsupported pile length, l, and the number of pile bents, N, are not clearly defined, and may vary somewhat with local conditions. If driven into firm material a pile can usually be considered as fixed at a point 5 ft. below the groundline and in soft material at 10 ft. below. The number of pile bents that can be assumed to share the impact of a mooring ship parallel to its front face, can safely be taken as the number of bents in one half the length of the vessel.

Numerical example

Maximum bending stress and deflection will be found for the case of a ship of 10,000 tons displacement striking the front of the wharf shown in the accompanying drawing while moving sideways at a rate of $\frac{1}{4}$ in. per second. The number of bents that can be counted on to share the impact is assumed to be ten; hence

$$C = \frac{1}{4}\sqrt{\frac{3\times2\times10^7\times3\times10^6}{10\times386.4\times7529\times10^9}} = 19.67 \quad \text{....(9)}$$

$$M_1 = 19.67\times178.2^2 = 624{,}460 \text{ in.=lb.} \quad \text{....(10)}$$

This bending moment produces a maximum compressive stress of 664 lb. per sq. in. in the pile. Contact with the moving ship will deflect the wharf:

$$\Delta = \frac{19.67\times10{,}692}{6\times3\times10{,}^6} = .012 \text{ in.} \quad \text{....(11)}$$

If, for comparison, it is assumed that timber piles 12 in. in diameter are substituted for the concrete piles and that the timber bents are spaced apart half the distance between the concrete pile bents, then

$$C = \frac{1}{4}\sqrt{\frac{3\times2\times10^7\times15\times10^7}{20\times386.4\times6500}} = 335 \quad \text{.....(9a)}$$

$$M_1 = 335\times16.96^2 = 96{,}330 \text{ in.=lb.} \quad \text{.....(10a)}$$

The maximum fiber stress due to this moment is 568 lb. per sq. in.; while this stress is of the same magnitude as the stress in the concrete piles the deflection of the timber structure will be much greater, namely

$$\Delta = \frac{335\times1018}{3\times15\times10^6} = .076 \text{ in.} \quad \text{....(11a)}$$

This is in accordance with the well-known fact that timber wharves possess greater elasticity than concrete wharves.

. . .

Over 125 Miles of Track Removed by WPA

SINCE August 1, 1935, WPA has removed more than 125 miles of single track of abandoned street railways on Manhattan Island, New York City. A feature of the project was the salvage of materials taken from the streets. As rails and auxiliary metal were taken up, they were cut into convenient lengths and delivered to the city of New York. The Department of Purchase, taking advantage of a rising market for scrap steel, sold the metal. Inasmuch as the project involved the removal of adjoining paving blocks, the engineers disposed of these by salvaging them. More than 5,000,000 granite blocks were renovated by WPA labor at a cost of four cents apiece and turned over to the city for use instead of new blocks that would have cost twelve cents. After the excavating, more than 125,330 cu.yd. of concrete were laid as a base for repaving, at a cost of $5,000,000.

Because of traffic conditions, it was necessary to regulate work to meet the time of least congestion. In order to do this, preliminary studies were made of traffic at the various working locations.

Mat-Vibrated Cement Macadam

by C. U. POLLARD
City Engineer, Tecumseh, Neb.

Slatted mats over which gasoline vibrators are wheeled give extra-compact slab by pressure-vibration

CEMENT-BOUND macadam vibrated to ensure extra compaction is being used in construction about 40,000 sq. yd. of pavement of Tecumseh, Neb. Besides this unusual construction process for cement penetration work, the city authorities have worked out an interesting combination of day labor and contract operations so that they can qualify for WPA funds and also get the faster progress of machine operations to complete the paving in one season.

A quarry was located about 4 mi. from the city and during the past winter the necessary ledge was stripped and the rock was broken out ready for crushing by WPA workers. A contract was then made for crushing the stone as the paving progressed. A consulting engineer was employed to prepare plans and specifications. To complete the work this season it was evident that with the 50 to 75 WPA workers available, it would be necessary to use labor saving equipment and the specifications provided for the use of elevating graders, spreader boxes and vibrators operating on slatted platforms to replace hand tamping. Under these specifications a contract to furnish supervision and equipment was awarded in April of this year.

The cycle of paving operations is as follows: After rough grading with the elevating grader, steel forms are set for half-at-a-time construction and the fine grading is done by hand. Then trucks drive in between the forms and dump into the stone-spreader box; after the stone is spread it is fine graded by hand guided by a template riding on the forms. Sand and cement for the grout are stock piled on the other half of the subgrade and a 10-S mixer with a swinging spout (left below) moves along on this half and delivers a 1:2 grout which runs onto the stone through a hail screen which permits the excess to be evened out with stable brooms without disturbing the rock.

After a 20- to 30-min. time interval, depending on air temperatures, platforms (right below) are put in place and gasoline-driven vibrators compact the penetrated stone and remove excess water and entrained air. The platforms are then removed and irregularities in the surface are corrected by adding stone chips and grout if needed. The platforms are then replaced and the slab is again vibrated. Finishing is accomplished by screeding, floating where the straightedge shows irregularities. A burlap drag gives a non-skid finish. An integral curb is built, following closely behind the finish of the slab. A 1:4 sand-gravel concrete, mixed in a small barrel mixer, is used for the curb and with the pavement is cured 72 hr. with wet burlap.

After the finished slab is old enough to carry traffic, materials for grouting the other half of the pavement are stock piled on the finished half and the grout mixer returns, this time operating on the finished slab.

Good results secured

The slab being produced is of high quality; penetration of the grout to the entire depth of the 6-in. slab is carefully checked. The daily records show that 0.9 sack of cement is being used per square yard of pavement. The expansion joints are 1- x 6-in. creosoted boards placed at 100-ft. intervals. There are two intermediate contraction joints in each 100-ft. interval; these are 2 in. deep and have mastic inserts. The longitudinal construction joint down the center of the slab is of the tongue-and-groove type. Most of the pavement is 25 ft. from back to back of curb.

With a crew of 60 WPA workers assisted by three experienced paving men, 800 sq. yd. of pavement per day are being completed. The management contract is held by W. J. Parker of Hastings, Neb., the rock crushing contractor is Ned Ray of Omaha, Neb., and the consulting engineer is Harry Nixon of Omaha.

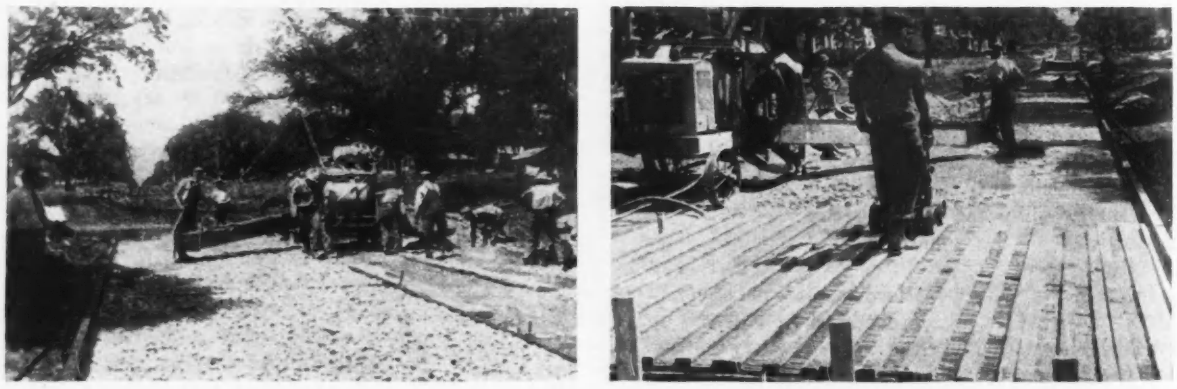


Fig. 1. (left) Cement-bound macadam pavements at Tecumseh, Neb., are grouted half-width by chute and hail screen. (right) Grouting on Tecumseh, Neb., pavements is followed by pressure-vibration using slotted mats.

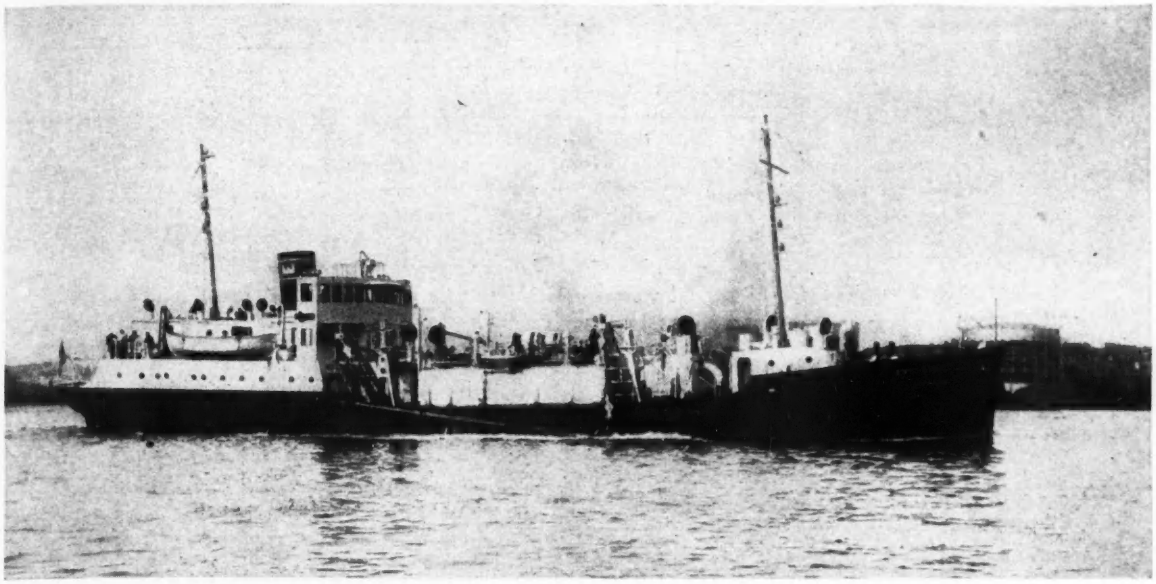


FIG. I. THE "PACIFIC" U.S.E.D. SEA-GOING HOPPER DREDGE, HAS IMPROVED DESIGN FEATURES

Hopper Dredge of Variable-Load Type

Movable panels permitting overflow or underflow in upper portion of hopper sides on new U.S.E.D. dredge "Pacific" give flexibility in operation

THE SEA-GOING hopper dredge "Pacific" recently launched at San Francisco for the U.S.E.D., was specially designed for dredging the shallower bar entrance channels to the smaller harbors along the Pacific Coast and will supplement dredging equipment operated on the Coast by the Army Engineers. An unusual feature of this dredge is the use of movable panels at the top of the hopper sides for varying the hopper capacity. The hull is arranged with the pumping compartment forward of the hoppers (whose maximum capacity is 500 cu.yd.) thus balancing load distribution and leaving ample space for engine room, crew quarters, machine shop and other facilities in the stern of the ship. All weights of hull and machinery were held to a minimum in order to obtain the least loaded draft practicable. Principal dimensions and general data are in the table.

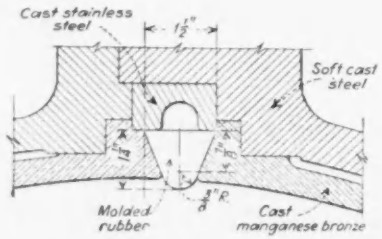
Power for propulsion is supplied by two 400-hp. direct reversible diesel engines driving the twin propeller shafts through hydraulic couplings and reduction gears. With engines operating at 450 r.p.m. the propellers turn over at 130 r.p.m. The propeller design is such as to afford strong towing effort at the slow speed (usually two to three miles per hour) at which dredging is done and at the same time to give effective propulsion running free.

Dredging equipment consists of one 18-in. dredging pump direct-connected to a 340-hp. motor which has an overload capacity of 25 per cent. The pump is connected to two suction lines 18 in. in diameter, one from the port and the other from the starboard drag pipe. Preliminary tests indicate that the pump will have a capacity of about 15 cu. yd. of fine sand per pumping minute and about 50 to 100 per cent more than that when dredging coarse sand and gravel. The maximum dredging depth is 45 ft.

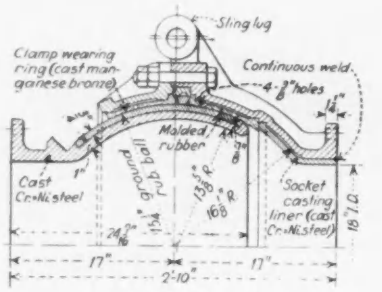
One dragpipe, with suspension gear and operating mechanism, is mounted on each side of the vessel. Although the usual operating program calls for the use of only one dragpipe at a time, the overload capacity of the pump motor was provided with a view to operation with both dragpipes whenever favorable conditions exist.

Particular attention was given to designing the ball and socket joints on the dragpipes, in order to have good dredge pump priming conditions. A detailed drawing of this joint is shown in Fig. 2. A notable feature of the joint is the rubber covering over the working portion of the ball surface. The socket has a rubber gasket ring against which the rubber-covered ball bears thus giving a rubber-to-rubber air- and watertight bearing surface in all operating positions of the dragpipe. The rubber coverings and seals were built in San Francisco at a cost of about $230 for each of the two joints.

The dragpipe connections to the



Enlarged Detail Around Gasket



Longitudinal Elevation

Fig. 2. Details of rubber covered ball and socket joint for 18-in. dragpipe.

hull were designed to permit disconnecting these suspended units of dredging equipment and stowing them in saddles on the main deck. This feature facilitates berthing and gives the vessel better speed and seaworthiness for long trips under adverse weather conditions. It also permits repairs to be made conveniently. The dragpipe davits are of the in- and outboard topping type designed by the U.S.E.D. for the dredge Culebra when operated for Pacific Coast bar work; a feature of their construction is a twin-spring suspension gear which absorbs the impact and shock resultant from rough weather or irregular bottom surface. Ball bearings are used in the davit blocks and the suspension is by wire rope instead of the usual chain rig.

Hoisting equipment for the dragpipes consists of two double worm, double differential drum electric motor-driven winches. The winches have magnetic brakes on the motor shaft and dynamic braking at all lowering points. Hand brakes are fitted for extra safety. The rate of raising the draghead off the bottom is about 30 ft. per minute.

Movable hopper weir gates

The upper parts of the hopper sides, that is, the portions above the main deck level, consist of panels 5 ft. high lifted or lowered by hydraulic rams. These panels, called weir gates, are designed to function in two positions; in the lower position the gate fits tightly against the fixed lower portion of the hopper side wall and the joint is made water-tight by a rubber strip; in the raised position the gate is held firmly in place 9 in. above the lip of the side wall below. In the lowered position the hopper capacity is 500 cu. yd. and overflow is over the top of the weir gates. When the gates are raised the hopper capacity is 300 cu. yd. and the overflow is through the 9-in. opening beneath the gates.

Table I—Principal Dimensions and Equipment, Hopper Dredge "Pacific"

Length overall	180 ft. 3 in.
Beam	38 ft.
Draft (loaded with 300 cu. yd. sand)	8 ft. 11 in.
Draft (loaded with 500 cu. yd. sand)	10 ft. 10 in.
Displacement { Light	865 tons
Displacement { Loaded	1600 tons
Power of engines	800 b. hp.
Propellers	Two 4 bladed, 7 ft. 6 in. diameter x 9 ft. 6 in. pitch (Towboat type)
Speed loaded	9.8 mi. per hr.
Speed light	11.5 mi. per hr.
Pump size	18 in. diameter 5 ft. impeller
Pump motor	340 hp.—Maximum overload 425 hp.
Hopper capacity	300 and 500 cu. yd.
Cruising radius	2200 nautical miles
Complement	11 officers, 27 men

a "two-compartment" ship, so as to be safe from sinking with any two compartments flooded when in fully loaded condition.

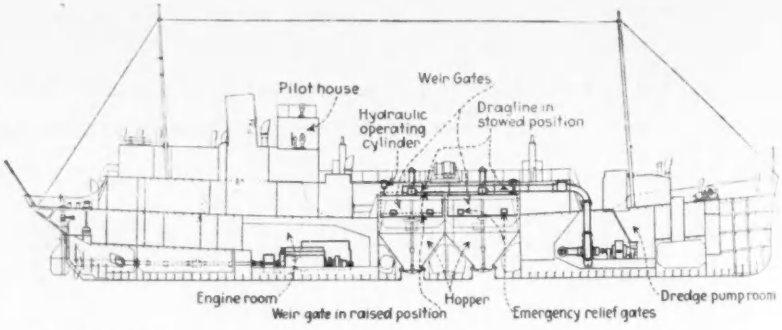


Fig. 3. Elevation of the new dredge showing pump room forward of hoppers.

With the flexibility thus provided the dredge can be operated effectively at the 300-cu. yd. capacity with maximum draft of only 8 ft. 11 in. When the gates are closed the capacity is increased to 500 cu. yd. with which the maximum draft is 10 ft. 10 in. Each of the four gates is provided with two small gates which can be opened readily for emergency discharging of a part of the load should the dredge be grounded with loaded hoppers.

All the essential operating equipment will be controlled from the drag tenders' cabs and from an operating station forward of the hoppers. One cab is located on either side of the vessel at a point whence a clear view of the drag pipe is to be had. Gages and indicating devices are mounted in these cabs and at the forward station.

Pilot house and bridge are combined in one structure totally enclosed because of the generally severe weather conditions under which the dredge will operate in bar channel dredging. The dredge was designed

The "Pacific" was built by the Bethlehem Shipbuilding Co., under the direction of Col. John J. Kingman and Col. T. M. Robins, division engineers of the two Pacific Coast division offices; San Francisco district engineer, Lieut.-Col. J. A. Dorst, was contracting officer; F. C. Scheffauer, principal engineer, South Pacific division office, was in charge of the design and construction, assisted by H. D. G. Baxter, senior engineer, and H. A. Lennon, associate Naval Architect.

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44-Hour Rail Week In Australia

EMPLOYEES on Australia's Victorian Railway will work 44 hours per week after Jan. 1, according to a ruling of the Arbitration Court. Of the 100,000 employees on all Australian railway systems at present, about 80 per cent have a working week of 44 hours. In Victoria, 9,700 work 44 hours a week and 13,200 work 48 hours a week or more.

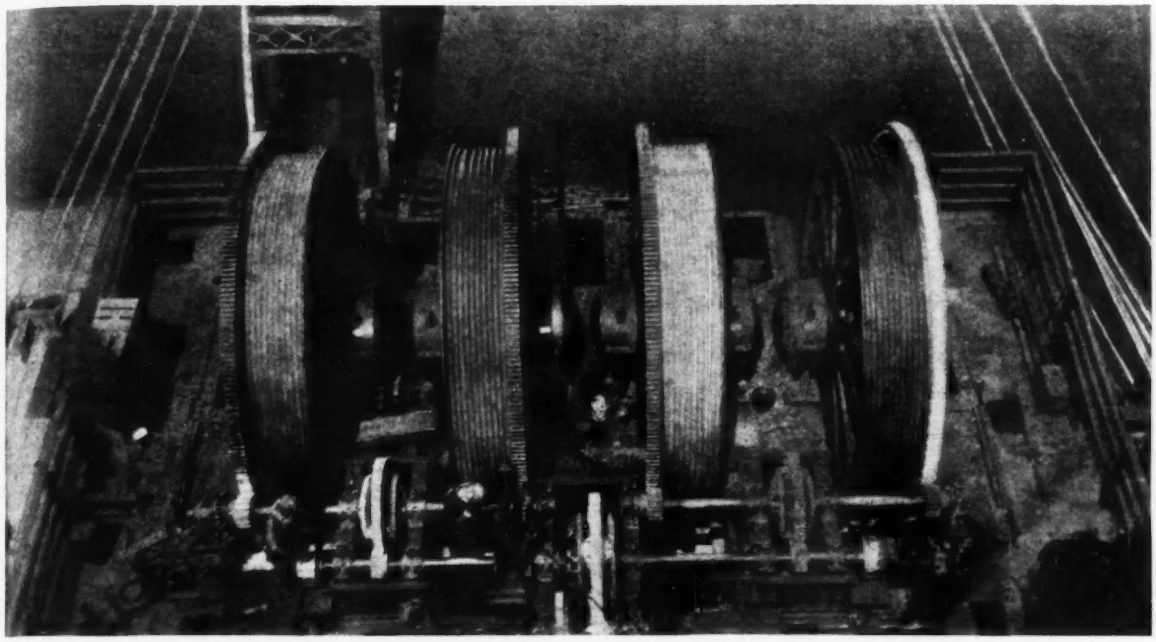

FIG. 1. INSTALLING MACHINERY ON THE TOWER TOP OF A MODERN LIFT BRIDGE

Operating Movable Bridges

by C. P. HAMILTON

Industrial Department, General Electric Co., Schenectady, N. Y.

Developments in electrical equipment during the past five years have caused important changes in movable bridge operation

THERE are several outstanding achievements included among the large number of movable highway and railroad bridges erected during the past five years that reflect the progressive spirit that has existed in the bridge engineering profession. In this period, for example, were erected the Cape Cod Canal lift bridge, with the longest movable span in existence, the Triborough lift bridge with the largest deck area and the three Pennsylvania R.R. lift bridges at Newark, N. J., with the fastest operating speeds. These particular achievements and others no less notable have necessarily required that developments in the electrical operating systems keep pace with the requirements of the bridge design engineers to insure safety and utmost reliability in control of the span movement.

While the application of direct power drive to the main cable sheaves at the top of the two towers of a lift span—in very much the same manner as the operation of the traction drive type of elevator operation in buildings—was accomplished ten years ago on Rock Island R.R. bridges at Devalls Bluff and Seneca, Ark., (*ENR*, Nov. 3, 1927) and on the James River Bridge at Norfolk, Va., the electrical system then used had no inherent means of keeping the span in alignment during its movement. This shortcoming of an otherwise major accomplishment in the application of power to vertical lift bridges was overcome by the development of an electrical system, now familiarly known as the "power selsyn drive." Before being applied practically to bridges, the theory of the system was carefully checked by tests in a General Electric factory and its effectiveness was then demonstrated to one of the outstanding consulting engineers on movable bridges. As a result of this pioneer work, the bridges listed in Table 1, have been built with the power selsyn unit system of cable sheave drive.

By locking the ends of the span together through the "phantom shaft" of the power selsyn tie, the span alignment is maintained within a fraction of an inch. The power selsyn system, in its simplest form, is shown in the schematic sketch of Fig. 2, from which it will be noted that at each end of the span there are two motors, usually of duplicate construction. One of these motors serves as a drive motor while the other is the power selsyn unit and is electrically cross-connected to a similar motor on the far-side tower in such a manner that the slightest phase displacement between the two units results in an immediate power transfer from the leading unit

TABLE 1 — LEFT BRIDGES USING POWER SELSYN DRIVE

Name	Location	Span (Ft.)	Motors on Each Tower	Reference
Missouri, Kansas, and Texas, R.R.	Booneville, Mo.	408	1- 80 hp.	*Eng. News-Record*, May 26, 1932.
Elgin, Joliet, and Eastern R.R.	Devine, Ill.	...	1- 10	
Elgin, Joliet, and Eastern R.R.	Joliet, Ill.	320	1- 75	
Chicago, Rock Island and Pacific R.R.	Joliet, Ill.	298	1- 75	*Railway Elec. Engr.*, Nov. 1933.
Ouichita River Highway Bridge	Columbia, La.	...	1- 15	
Cape Cod Canal Bridge	Buzzards Bay, Mass.	545	1-150	*Eng. News-Record.*, Jan. 30, 1936.
Triborough Bridge	New York City	310	2-200	*Eng. News-Record*, Aug. 5, 1935.
*Marine Parkway Bridge	New York City	540	1-150	*Eng. News-Rec d*, Jan. 21, 1937.
Torrence Ave.	Chicago, Ill.	276	1-150	
Mexican National R.R.		150	1- 15	

* This bridge also uses 50 hp. auxiliary power selsyn drive for maintaining span alignment during emergency operation.

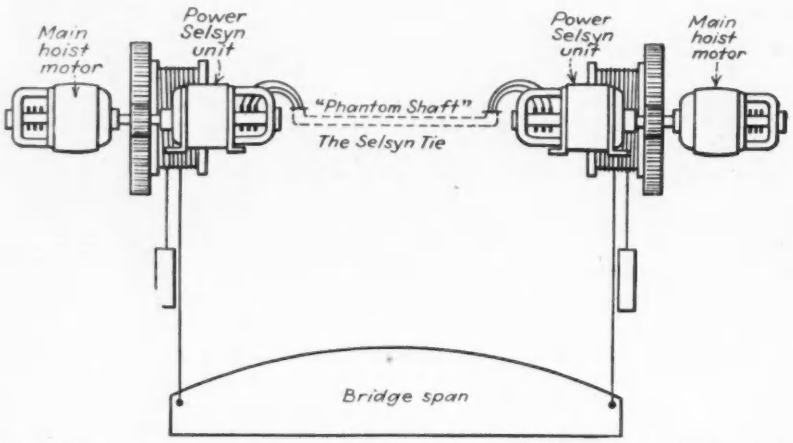

Fig. 2. Schematic arrangement of the power selsyn system of operating vertical lift bridges with direct cable drive.

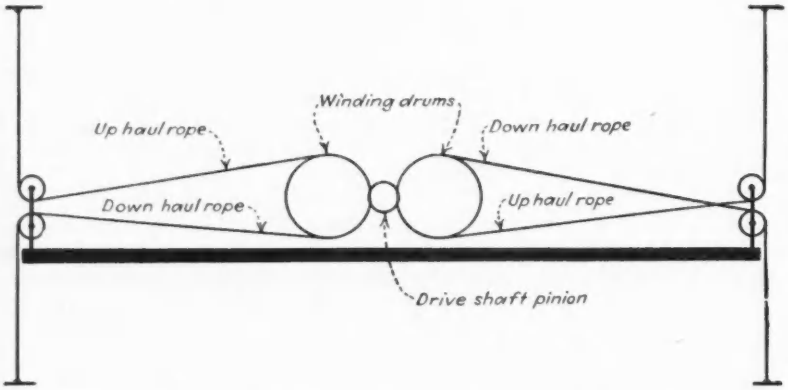

Fig. 3. Center span drive for vertical lift bridges showing usual arrangement of hoist ropes.

to the one that is tending to lag.

The result is equivalent mechanically to a slight torsional twist in a long shaft, although the opposite ends maintain the same speed. The magnitude of the power transfer increases as the phase displacement increases and reaches a maximum at approximately 90 electrical degrees. Translating this figure of 90 electrical degrees into terms of mechanical degrees, and assuming that 60-cycle, 600-r.p.m. motors are used, this phase displacement between the two rotors will correspond to 15 mechanical degrees. Assuming that the gearing is arranged so that the span moves at a rate of 2 ft. per sec. when the motor speed is 10 revolutions per sec., the displacement of 15 mechanical degrees between the power selsyn units on opposite towers will correspond to a difference in elevation of the ends of the span of but 1/10 in.

In normal operation, the displacement between the two units is very much less than indicated by the above example, and even when the units transmit full-load torque, the displacement amounts to only about 1/3 of the values given.

In case of failure

Emergency operation of direct-cable-drive vertical lift spans is effectively arranged for in several ways to provide a means of operating the span in the event either of failure in the power supply or in the electrical system. As far as the power supply is concerned, two separate sources are usually considered adequate assurance for continuity of operation. One power source may be the public utility service while the other rests with an engine-driven generator installed at the bridge.

In case of failure of the normal electrical operating system, provision is made to operate the bridge in the following ways:

A. Should one of the drive motors or its control system fail, or the electrical cables break down, the power selsyn motors will supply adequate power to move the span at rated speed and at the same time maintain the span in alignment.

B. Should one of the power selsyn motors fail, or its control or associated electrical cables break down, operation may be continued at normal speed and the span alignment maintained within allowable predetermined tolerances by the use of skew-limit devices. These devices may take the form either of limit switches geared to each tower to open a control circuit when the skew reaches a predetermined amount, or of an electrical differential system connected to the machinery on the two towers. In the latter case, the units may be connected to retard the end of the span which tends to lead before the ultimate skew is reached and the power cut off of the driving motors.

C. Separate smaller capacity drive motors are usually provided to operate the span at much slower speed when power is obtained from the engine-driven generator. These driving motors are clutched to the operating machinery through a higher gear ratio either by remote control or by manual operating levers. When operating the span with the auxiliary motors, alignment may be maintained by the use of either or both of the

following means:

(1) By using a power selsyn system similar to the main drive.

(2) By using skew-limit devices as previously referred to for keeping the span within predetermined tolerances.

With the direct-cable-drive system of operation supplemented by these emergency controls, the possibility of being unable to move the span at any time is extremely remote.

The operation of the bridges now in service with this system of drive has been most successful. The use of power selsyn drives has resulted in a large saving in structural steel since it permits the removal of all machinery and the haulage cables from the movable span.

Variable voltage d.c. control

The variable-voltage direct-current control system has been applied to several large vertical-lift bridges using the center-span-type of drive which is shown schematically in Fig. 3. This drive is particularly advantageous for bridges that have to be opened frequently because of the smoothness of operation, the simplicity of the control system and the ease of adjustment of operating speed.

TABLE 2.— RECENT LIFT BRIDGES USING VARIABLE VOLTAGE CONTROL

Name	Location	Span (Ft.)	Weight of Span (Tons)	Drive Motors	Reference
Albany-Rensselaer	Albany, N. Y.	341	2730	2–250 hp.	*Civil Engr.*, May, 1933
Troy-Menands	Menands, N. Y.	341	2750	2–250	
Penn. R.R. 3-track	Newark, N. J.	230	2100	3–150	*Railway Elec. Engr.*, May, 1935.
Penn. R.R. 2-track	Newark, N. J.	230	....	2–150	
Penn. R.R. 1-track	Newark, N. J.	230	....	3–135	

In the variable voltage d.c. system, the use of properly designed generators, in combination with the drive motors on the span, provides the additional feature of inherently limiting the maximum torque and hence the stress on the machinery to within predetermined values. Smoothness of acceleration and retardation and freedom from sudden torque changes prolong the life of the machinery and of the haulage cable. Also of importance in the operation of bridges using a double or three-motor drive with variable voltage is the fact that the span may be operated at substantially normal speed with one of the drive motors cut out for repairs, providing of course the generators and remaining motors are properly designed and connected.

While the variable-voltage system has been most generally applied during the past several years to vertical lift bridges, it is also equally applicable to bascules. For example, in Seattle, the west Spokane St. double-leaf bascule bridge, has been in successful operation since 1931. This bridge, with leaves 144 ft. long and weighing 1634 tons, is operated by two 65-hp. motors per leaf from a 100-kw. generator. The most recent bascule bridge installation with variable-voltage control is a double-leaf span over the Intracoastal Waterway in Florida. Each of its 40-ft. leaves is operating by a 10-hp. direct-current motor from a three-field-type variable-voltage generator rated at 10-kw. and driven by a gasoline engine.

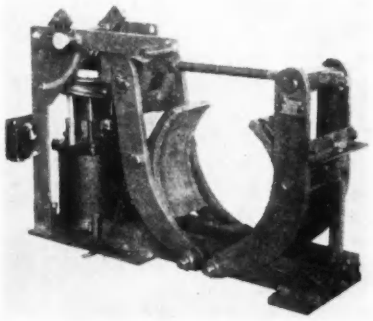

Fig. 4. Variable-torque thrustor brake which is used to produce an artificial load on the motors and reduce speed for seating the span.

For bringing the span of either a vertical lift or a bascule bridge down to the seat, several expedients are resorted to. In one type of control the span is positively stopped at the nearly-open and nearly-closed position by forcing the operator to return the controller to the "off" position and pause at that position for a definite adjustable time interval. Power may then be applied (although restricted to two or three points of control) for moving the span to either the fully-open or fully-closed position. In this manner, a positive check is obtained on the operation of the system and also on the alertness of the operator.

Changeable load conditions often exist on many spans due to snow, ice and wind that make speed control rather difficult particularly with single-speed alternating-current wound-rotor motors with resistance control. This difficulty of speed control also exists on many bridges using two-motor drive. In order to produce definite partial speeds when these variable-load and over-motored conditions exist, the use of the variable-torque thrustor-operated brake has proved advantageous on a number of vertical lift and bascule bridges. This type of brake (Fig. 4) is provided with a variable-speed single-phase motor driving an impeller in the oil thrustor unit which in turn develops the pressure for releasing the shoes. By controlling the speed of the thrustor motor, a selective amount of braking torque may be developed to produce an artificial load on the span drive motors, which will run at reduced speed when operating on points of control usually used for seating.

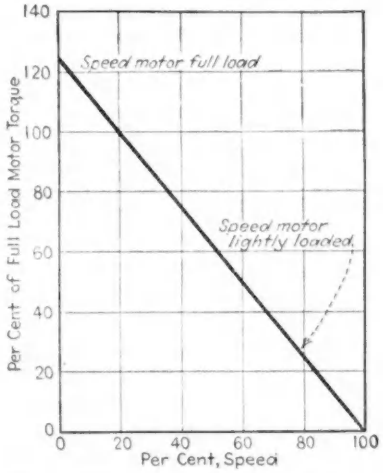

Fig. 5. Chart showing how speed of motors may be varied by applying load through a thrustor brake to wound-rotor induction motors.

This may be clearer by referring to Fig. 5. If the motors normally operate at about 25 per cent torque, the operating speed on the third point of the control, laid out for usual bridge operation, will be 80 per cent of full speed. By applying an artificial load

with the use of the variable-torque thrustor brakes, the speed may be slowed down to 20 per cent speed as the brake torque increases the total load on the motor to the rated full-load torque.

The use of alternating current motors which have two synchronous speeds is also being considered as a means of obtaining a slow speed for seating the span, despite the fact the control is somewhat more complicated than that required for a single-speed motor.

Difficulties which have been experienced in the past in the operation of both vertical lift and bascule spans, due to rebound when seating, have largely been overcome in the following manner. In bringing a span to its seat, it is first of all essential that the operating speed be reduced to a creeping speed. This is possible by properly designing the control resistors and also by the use of artificial loading on the motors as previously described. In addition to obtaining a creeping speed as the span approaches its seat, it has been found advantageous to maintain limited power on the driving motors to force the span down on its seat and hold it there while the brakes are setting. The operation of applying the brakes and then removing power from the drive motor usually is made automatic in the control system by circuits which are set up when the span trips the "fully-closed" switches.

A unique system of controlling the normal service and emergency brakes, during emergency operation from the gasoline engine, was developed for the three Pennsylvania Railroad lift bridges at Newark. During the mechanical changes that are usually necessary in transferring the operation from the engine drive to the motor drive, difficulties have previously been experienced with the span raising slightly off the seat and causing misalignment of the rails and failure of the signal circuit to establish contact. These difficulties were successfully overcome by driving from the engine a direct current generator to supply power to the brakes. This generator has a special design characteristic such that even with an engine speed range from 300 r.p.m. to 1,400 r.p.m., the voltage at constant load has practically the same value. In this manner, the electric brakes are used for either normal operation from the electric motors or for emergency operation from the gasoline engine drive.

Swing span operation

The operation of swing spans has largely remained unchanged except for the greater need of more accurate means of indicating the full-closed position in addition to providing more accurate slow-speed control to which reference has been previously made. There are two methods of obtaining accurate position indication. One is by the use of photo-electric units attached to the end of the span which in turn control indicating lights on the operator's desk when the span is lined up. The other method is by the use of a selsyn type of indicator which, in addition to having a scale to show the span position at all times, also has a greatly enlarged secondary scale and a separate pointer which becomes effective only during the final closing of the span.

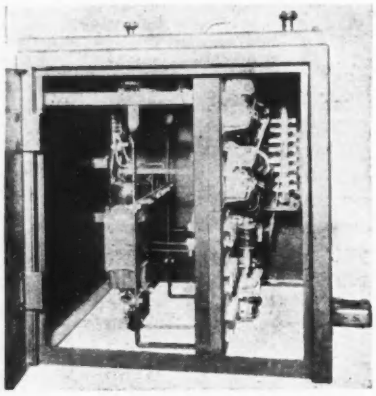

Fig. 6. Control equipment for modern small bridges is often mounted with the operating panel in a single completely enclosed box.

Enclosed control units

The control equipment for small size bridges has been combined completely within a control desk as shown in Fig. 6. The arrangement of the control in this manner is particularly advantageous both from a safety standpoint to the operator, since all of the control devices are enclosed within the steel cabinet, and because the complete unit may be factory assembled, wired and tested. This expedites the installation by elimination of the wiring between the usual separately-mounted control panel and the control desk.

There is a definite trend also in the design of bridge control requiring panels in addition to the control desk to enclose all current carrying devices either individually in steel cabinets or collectively within metal cubicles with only the operating handles of the switches readily accessible. This arrangement of the control devices, which is the general trend in all industrial applications, is particularly desirable from a safety standpoint, and in addition provides protection from corrosion and from abuses during installation.

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Tax-delinquent Land in Cities Turned Back to Use

HIGH TAX DELINQUENCY on real estate the past few years, with resultant foreclosures, has overloaded many cities with idle, non-productive land, according to reports to the International City Managers' Association. Some cities have turned their surplus land into parking lots or recreation areas; others have gone more or less permanently into the real estate business, to turn tax-foreclosed properties to their financial credit.

A year ago a complete inventory of all city-owned property was made in Milwaukee. After conferences with various city officials, including the city planning and city real estate departments, it was decided to lease several pieces of downtown property as parking lots and other parcels were ear-marked for future use as parks, playgrounds, sites of public buildings and street widenings. No public use was found, however, for over 700 parcels of city-owned property.

A list of these properties, together with their selling prices, was prepared by the board of public land commissioners, adopted by the council, and released to the Milwaukee Real Estate Board for distribution among its membership and to licensed real estate brokers. For sale of property, any licensed broker is entitled to a commission of 5 per cent. The city, however, reserves the right to make sales directly to buyers it contacts.

The Value of a Valve Record

by M'Kean Maffitt

Superintendent, Water and Sewer Dept., Wilmington, N. C.

A practical water-works man explains how and why he maintains an accurate system of valve maps and records

Systematic mapping of valve locations in water mains is quite as important as the proper installation of the valves. Valves that cannot be found immediately when needed are little worse than useless. Repeated experience in emergencies has demonstrated that they should be so set, recorded and maintained that they are quickly located and easily operated.

Even on trivial accidents, such as a fire-hydrant broken off the branch line, if the gate valve on the branch line cannot be found there is little purpose in putting it there in the first place. The writer has vivid recollections of a situation wherein a negro in an automobile, fleeing from the police, rounded a corner so fast that the car skidded into a hydrant and broke the top flange off the boot.

The accident occurred on a flat street with poor drainage. The hydrant line was very short and tapped into a 12-in. main and within a short interval the area was covered with water. Meantime the hydrant had disappeared into the cavity washed out by the flow of water. The measurements locating the valve-box were from the face of the hydrant. And since this was out of sight the only recourse to locating the valve box was to feel for it along the surface of the street. Before this could be accomplished, however, the water rose about six inches and a 2-in. layer of sand, washed up out of the hole, covered the top of an uneven brick pavement. It then became necessary to use a dipping needle and eventually the cast iron valve-box was located. Now we measure and locate all valves from two or more permanent objects, record this information where it is quickly available, and stand ready to cope with the unexpected when it occurs.

The record system includes a key-map, section, and corner maps. The key map is made to a scale of 1 in 1,000. On this single lines represent streets and heavy dotted lines are used to mark off sections. Each section area is numbered, the number referring to a section map.

You will agree that:

"Digging into asphalt pavement covered with swirling water and two inches of sand on a cold night is a job to be avoided, if possible.

"This experience strengthened resolutions to carefully locate and record all valves so that they can be found despite burst mains, falling walls, run-away negroes, or freight cars carrying hydrants around corners to places where they shouldn't be."

Section maps, each covering an average of 16 squares or blocks, are made to a scale of 1 in 100. Fig. 1 (p. 832) shows the actual layout of Sect. No. 14, an area in a congested business district of Wilmington. It shows the locations of hydrants, valves and mains, along with such general data as will enable any water-works employee to tell at a glance the approximate location of principal objects. A third map, called the corner plan, is made on a scale of 1 in 10. These show all the detail data at each corner in the city. A typical corner plan is given in Fig. 2. (p. 832).

Principles of map layout

Section maps are so made that they overlap adjoining sections, thus completing a map of the entire system. (There is also a whole distribution system map, made to scale of 1 in 500, for office and general use in planning extensions). Section and key maps are made on standard sheets, 17 x 26 in., blueprinted and bound. The binder is a stiff backed, loose-leaf affair, and it is carried in a tin container built into the top of the repair truck body. The binder for the corner plans is also carried in a tin container fastened to the roof of the truck or set inside a tool box.

Corner plans (Fig. 2) are made on standard 8x10½ in. sheets with a 2 in. binder space at the left end. Designed for use by those inexperienced in blueprint reading they are drawn and bound so that when an operator opens the binder top onto his left arm, faces west (towards the river) the map is oriented with north to the right. Since they are made on a scale of 1 in 10 considerably more detail can be given than is shown on a section map. Tape measurements are given, and valves and hydrants are indicated at correct position with reference to other physical conditions.

In Fig. 2, which is a detailed map of the Chestnut and Water St. intersection on Fig. 1, it will be observed that locations are shown by measurements from two or more permanent objects, so that if there is a flood from a broken main or hydrant, or if the street surface is covered by snow, it will still be quite easy to locate a valve box.

The large black circles show the two fire-hydrants on this corner and the different valve arrangements. The numbers at each hydrant refer to the hydrant book in which is recorded such information as: size, make, specifications, date set, connection at main, whether or not there is a valve on the branch, static pressure, delivery in g.p.m. and residual pressure, date inspected, and repair data. A valve record book, containing com-

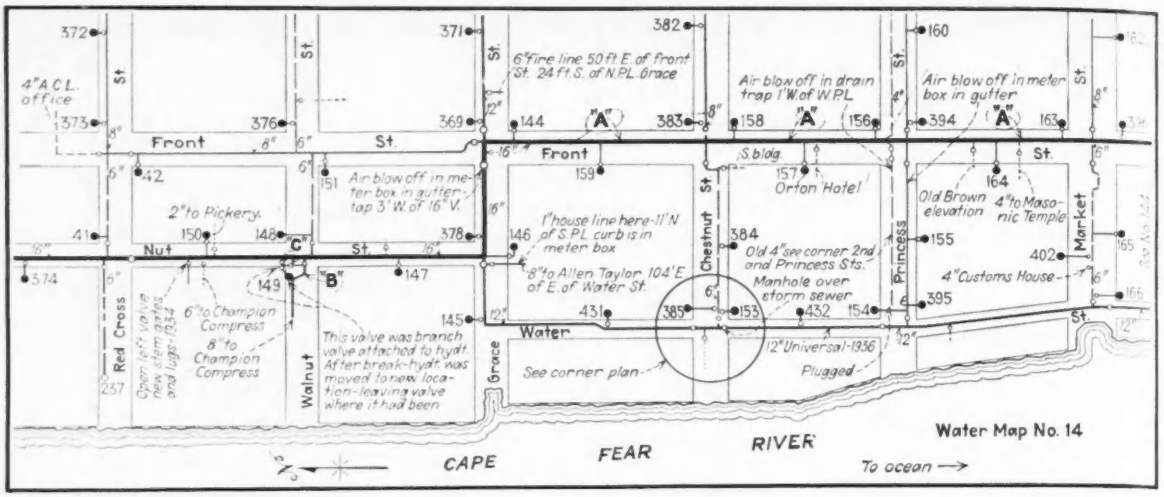
4"A.C.L. office
Front
St.
Nut
Red Cross
Walnut
Grace
Chestnut
Princess
Market
6"fire line 50 ft. E. of front St. 24 ft. S. of N.P.L. Grace
Air blow off in drain trap 1' W. of W.P.L.
Air blow off in meter box in gutter
Air blow off in meter box in gutter - tap 3' W. of 16" V.
2"to Pickery
6"to Champion Compress
8"to Champion Compress
This valve was branch valve attached to hydt. After break-hydt was moved to new location - leaving valve where it had been
1"house line here - 11' N of S.P.L. curb is in meter box
8"to Allen Taylor, 104' E. of E. of Water St.
Old 4"see corner 2nd and Princess Sts.
Manhole over storm sewer
See corner plan
12"Universal-1936
Plugged
S. bldg.
Orton Hotel
Old Brown elevation
4"to Masonic Temple
4"Customs House
Water
CAPE FEAR RIVER
To ocean
Water Map No. 14

Fig. 1. Section map showing distribution system information covering an area of about 16 city blocks.

plete information on each and every valve in the system is also maintained.

Both the valve book and the corner plan book are indexed according to street number, thus making reference very easy. The north and south streets, with the exception of two, run parallel with the river and are numbered. Thus the street next to the river, Water St., is the first in the book and the north valve or hydrant is the first recorded. The others follow in regular rotation as the next street to the south intersects. In the valve book the information concerning the intersection of Chestnut and Water St. is recorded as follows:

Twelve inch main line north, R. D. Wood, horizontal stem, open right, Universal joints, bevel gears cased in grease, brick manhole, set 1936.

Six inch main line east, R. D. Wood, vertical stem, open right, stuffing box cased in grease, cast iron box, cut into old main, set 1936.

Six inch Columbian, vertical stem, open right, attached to hydrant, S. E. corner, stuffing box cased in grease, cast iron box, set 1910.

Six inch Darling tapping valve on branch to hydrant N. E. corner, open right, vertical stem, stuffing box cased in grease, set 1930.

One and one quarter inch service line west, Walworth brass, open left, cast iron box, set 1913.

Valve connection practice

On Fig. 2 it is shown that hydrant No. 153 has a valve attached at the base of the barrel or boot; that hydrant No. 385 has a valve at the main. According to present practice valves on hydrant branch lines are no longer

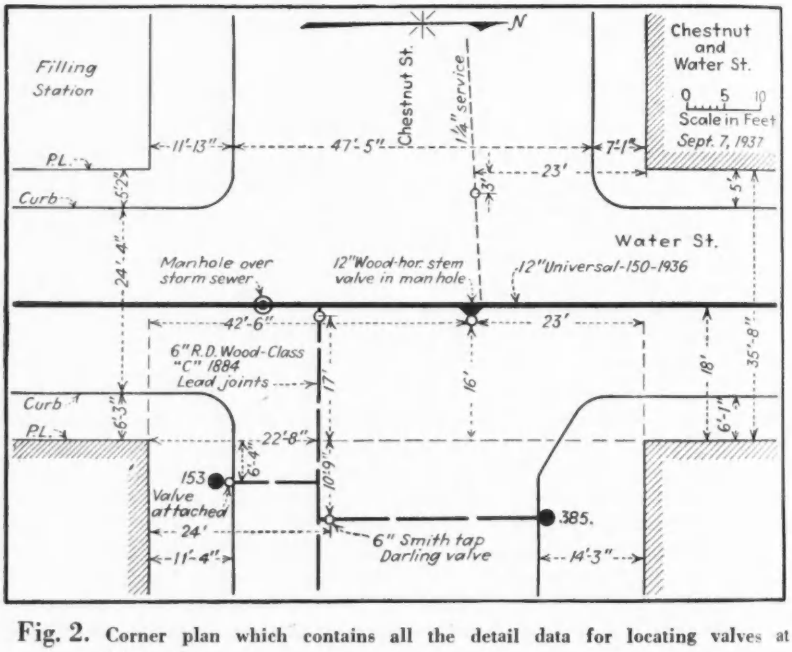

Fig. 2. Corner plan which contains all the detail data for locating valves at intersections.

placed at the hydrant unless the main is so close to the hydrant that there is only room for the valve.

There are several reasons for this: When the valve is attached to the hydrant it is impossible to protect the branch line with the valve and, as stated before, the valve may become disarranged if and when the hydrant is broken or blows off the end of the line. Also, it is impossible to tell whether or not the valve will hold when the water is shut off after a break. And sometimes it is impossible to get to the valve because of the rush of water when the boot is broken.

When main line shut-offs are large as in the case of Front St. (see "A" Fig. 1) it is necessary to close two 16-in., one 12-in., six 8-in. and two 6-in. valves to isolate the section. This will "kill" ten hydrants (two not shown in Fig. 1) and four blocks of pipe main. If this should occur during a fire it would materially cripple fire fighting efforts.

Hydrant No. 157 is about 15 ft. from a building that is seven stories high. In case of a fire and falling walls it is possible that this hydrant would be driven into the ground, breaking off the valve attached to the boot. It

would then be necessary to shut off the Front St. section as shown.

However, if the valve to this hydrant were at the main, the hydrant could be knocked down, broken off, or carried away and still the valve at the main would not be disturbed. And if there were measurements to this valve location from two or more permanent objects it would be possible to locate the valve even if it were covered with debris. Otherwise with only information as to the distance out from the face of the hydrant to the valve, it is impossible, except by luck or grappling, to find the valve.

At corner marked "B" (Fig. 1) there is a railroad track on a curve so sharp that cars frequently come off the rails. Hydrant No. 149 was located on this corner on the Water St. sidewalk just north of the Walnut St. property line. It was too near the rails for safety and one night a very long furniture car jumped the track at the wrong place.

The end of the car struck the hydrant, breaking it off just below th bottom flange of the hydrant barrel. This left the full area of the 6 in. boot wide open. Imagine the flood! The hydrant was directly connected to a 16-in. main that carried ninety pounds pressure. The branch valve was attached to the hydrant (that is, before the accident it was attached.) The hydrant had dropped into the hole washed out by the flood of water and only the top of the operating nut was visible now and again in the swirl of water.

At the time it was impossible to determine whether or not the branch valve was misplaced. But even if it wasn't misplaced it could not be reached because of the water torrent. Therefore, it was necessary to close two other 6 in. valves, one on the direct line at the main, the other on a reinforcing line leading from the hydrant branch to an 8-in. main feeding a sprinkler system. These two valves are shown at "C" (Fig. 1).

The valve on the interconnecting line was quickly found but the one on the direct line at the main was covered with asphalt, sand and water—an uninformed street department employee, in patching the broken pavement had poured hot asphalt over the slightly sunken valve box. In this case, the measurement from the face of the hydrant was of no use. And the place where the hydrant had been was a swirl of water three feet deep.

With the aid of a dipping needle the cast iron box was finally located, and after considerable trouble digging in the asphalt the valve-box top was removed.

Digging into asphalt pavement covered with swirling water and two inches of sand on a cold night is a job to be avoided, if possible. This experience strengthened resolutions to carefully locate and record all valves so that they can be found despite burst mains, falling walls, run-away negroes or freight cars carrying hydrants around corners to places where they shouldn't be.

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Orders to Cease Pollution Issued by Indiana Health Department

THE INDIANA state health department has ordered Gary, Hammond, East Chicago and Whiting to cease pollution of Lake Michigan, the Little and Grand Calumet rivers and the Indiana Harbor ship canal. The mayors of these places, meeting in Indianapolis with health department officials, have agreed to comply with the order, but stated that they were unable to finance the construction of sewage disposal plants, pumping stations and intercepting sewers. The cost of equipment was estimated to be between $5,000,000 and $6,000,000.

Indiana law provides that the state department must issue a second order. It is reported that this will be issued soon. The cities will then have 30 days in which to start corrective measures. An effort will be made to induce the state department to permit the cities involved to create a sanitary district and levy bonds for sanitation purposes up to 2 per cent of the assessed property valuation, as is now accorded by Indiana law to cities of the second class. Gary, Hammond and East Chicago will seek this privilege.

South Bend to resist

The state division of public health faces a long fight to force South Bend to build a sewage disposal plant, which engineers have estimated will cost between $3,000,000 and $5,000,000. The first step in resisting the order will be an appeal to a St. Joseph County court as provided in the Indiana sanitary law, according to South Bend City Attorney Edwin W. Hunter.

The explanation for the refusal of the city to entertain the order for construction of the plant is that the city's bonding power today is far short of the required total of $3,000,000 to $5,000,000 necessary for the project. It is further pointed out that this bonding limit is set by the state constitution at 2 per cent of the total assessed valuation of taxable property. South Bend has outstanding at this time bonds to within $270,000 of this limit.

It is understood by South Bend city authorities that the state of Michigan, which is seeking to force South Bend and Mishawaka sewage out of the St. Joseph river, would first be forced to sue in a federal court for a mandate against Indiana. Indiana then would be required, if mandated by a federal court, to take action against South Bend and Mishawaka. The state health board's order would be a part of this proceeding.

The general impression among city authorities toward financing the sewage disposal plant is that the courts will have to assume all reponsibility for raising and providing money for its construction if the work is ordered done by the courts, which would mean a state or federal grant.

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Motor Rail Cars In Argentine

ARGENTINE State Railways have inaugurated a motor rail car service on their Patagonian line between Comodoro Rivadavia and Colonia Sarmiento in the territory of Chubut. Under the new service, only four hours will be required for the 125-mile trip, which formerly required 8 to 10 hours with steam locomotives.

The Profession's Current Problems

Questions raised by efforts to strengthen engineer license laws and by the union movement, discussed by Willard Chevalier before the engineering examiners

The following abstract of a talk made by Willard Chevalier, vice president of the McGraw-Hill Publishing Co., before the National Council of State Boards of Engineering Examiners at the annual meeting of that body held in Scranton Oct. 11-13, is reproduced here because of the wide interest in the subjects discussed by Col. Chevalier.—Editors

HERE I am today in a den of national engineering examiners and I am one of those who, some fifteen years ago, opposed the licensing of engineers. I opposed it for reasons which appeared to me at that time to be good ones—reasons which, incidentally, constitute a substantial part of the problems that remain to be solved in the administration of engineer licensing. I make this statement simply as a point of departure to consider some of the problems that now confront this profession of ours, or should I say, that now confront us in our efforts to establish this calling of ours as a profession.

This word "profession" is bandied about very glibly but I have not found very many people who will agree on a clear-cut and convincing definition of what the term means here and now in this society of ours.

Does it mean any calling that, in the public interest, is closed by a statute to all except those duly licensed to practice it? Does that make a professional man of a barber or a bar-keeper? Obviously our conception of a profession and a professional man cannot be expressed accurately by a term that is used so loosely; neither can we create the profession that we have in mind merely by the enactment of a statute or the technical definition of a term.

Even in medicine and law, with all their statutory regulation, the public still must rely in large measure upon the moral influence of a professional spirit to make this thing effective and make it work. In other words, the point I am trying to make is that there is something bigger, more vital, and more fundamental in a professional relationship than anything you can write into a statute. If you have no profession to back your statutes, they become just so much ink on a piece of paper. Subject to the vagaries of the ordinary police activities like any other statute or ordinance.

Laws do not make professions

So it must be evident that the enactment of a statute does not make a profession. The enactment of a statute, indeed, may betray you. It may create a false sense of security, it may lead you to put too much faith in the letter of the statute, unless it has behind it the spirit and the soul of a profession to breathe life into the letter of the law and to give it the force that it needs to make it effective.

It is true that the work of the engineer has a secondary effect upon the welfare and the security and the safety of the individuals who compose the community. No matter who may pay his salary, no matter who may be his client, technically speaking, so long as he is engaged in work that affects the security of the public, their health, their safety of life and limb, there is a public interest in how well he does his work.

And so again, the community sets up a standard, a minimum standard. That is all we can do. Anyone who is tall enough to step over that can get by. Even a charlatan with minimum technical qualifications can get by. And unless we have in the profession of engineering some vital influence above and beyond the mere statute itself, it will be but a question of time before those of minimum technical qualifications will demand and be accorded the right to practice regardless of what you and I may think of their other professional qualifications.

And these other qualifications are of the very essence of what I understand to be a profession. Certainly they mean a great deal in law and medicine. Why? Because of the confidential relationships with uninformed laymen who are not in a position to protect themselves or guard themselves against the charlatan. Shall we be able to maintain and enforce similar standards in the case of the engineer, or shall we be forced to rule those out? Are we in danger of facing a ruling one of these days that any one who can meet the minimum technical requirements has a right to be licensed and practice his calling? That is when we shall find out whether we have a profession or just another licensed trade.

When the state qualifies men for the practice of a profession, all it can do is qualify them by a statute. And that means a few simple and definable qualifications.

The determination of those qualifications is one of the problems that are confronting you as engineering examiners today. What the profession, so far as its statutory regulations are concerned, is worrying about today is how to set them high enough to keep out the unworthy and low enough so that too many will not be left to go somewhere else.

Largely employees

When we start drawing this analogy between the engineer and the doctor and the lawyer, we find another false note. We find that it is the intent and the ambition of the young doctor and the young lawyer sooner or later to go in practice for themselves. They may for a time work for someone else; they may be a part of a professional organization as subordinates. But either they are going to become partners in a firm or they are

going to have their own practice. That is true of the bulk of them.

It is not true of the great bulk of young engineers. It cannot be true. I doubt that it ever will be true. It may be less true in the future than it has been in the past. I cannot pass judgment on that. But it is a fact that the great bulk of your engineers must look forward—and I say this in no invidious sense whatever—to being an employee on someone's payroll—that of the public, some corporation, or an individual. Only a small proportion ever will achieve the place of the independent practitioner whom the uninformed laymen must trust blindly as to his professional integrity and skill. We might just as well face that reality and not delude ourselves by setting up any fictitious conditions that do not exist.

How shall we regulate our profession in the face of that reality? The moment you have that condition, there are certain corollaries that are inseparable from it. You will have a very great difference in the ultimate responsibilities of the men who call themselves engineers by virtue of a definition in a statute or on a diploma. One man may have almost no ultimate technical responsibility for his work. He will be directed, guided and supervised from soup to nuts. He will have eight or ten bosses over him, every one of whom is responsible for his work in various degrees. He has no ultimate technical responsibility. He is hired by other engineers who take full professional responsibility for his work and his ultimate client—the layman—may never know of his existence. Let us face that fact.

Truly professional

On the other hand, we have at the top men who will carry the ultimate technical responsibility to their clients. The chief engineer of a railroad, the consulting engineer for a city, the chief engineer of an industrial plant or a city department who reports to a lay board of directors or a lay city council—that man must take the ultimate technical responsibility for his decisions. There is no technical man above him who will modify his decisions or take responsibility for his failures. There is an *ultimate technical responsibility* and to me it is that relationship which constitutes the core of a professional relationship.

There is another situation that is involved. Many of these engineers who have not ultimate responsibility always will regard the other engineers, not as their professional brethern, but as their bosses. A very eminent engineer once told me that he considered it a definite part of his responsibility to his employer to hire his staff on the lowest terms consistent with competent service. I do not mean to imply that that is typical; neither am I attempting here to pass judgment on that attitude. But the fact remains that that professional engineer is bound to serve his client with maximum efficiency and naturally he wants to get his work done competently at the lowest possible cost. And this means that we have a very definite problem in the relation between employer-engineer and employee-engineer, *insofar as their current relationship is concerned.*

Professional societies needed

We thus have the employer and employee relationship among engineers, all of whom have the same words on their diploma, all of whom can qualify under the same statutes. That is another reason why I do not believe that we ever are going to solve these problems by statutes alone. That is why I believe that the several professional engineering societies today have an even broader field of usefulness and a more important function to perform than they ever had before the statutory licensing of engineers. If we are going to give spiritual effect to the bare flesh and bones of our engineering legislation, we must have these professional societies which, entirely apart from statutory requirements, will take into account everything else about a man in addition to his educational and technical attainments.

That is the reason why I do not want to see any formal relationship between these two. I do not want to see our long-established professional bodies made tails to any statutory kite, neither do I want to see those societies involved in the operation of a licensing statute. They have two different jobs to perform, both of which are vital. And the national engineering society's function today has become even more vital than before. It is they, with their tradition of disinterested and voluntary association for purely professional concerns who must be a position to establish and enforce those standards of professional responsibility and ethics that cannot be written into a statute.

Therefore, I hope that our professional societies, both old and new, will recognize today their responsibility for the less sharply definable concepts of what constitutes a profession and that they will guard them more closely than ever before.

The union question

Now what about those employed engineers that I was talking about? What are we going to say to those men when they come to us and ask, "Shall I join the union or not?" Well, I will tell you what I would tell them. I would say: "My boy, you are free, white and twenty-one. You have your own way to make in the world. You must earn your living, the best living that your energy and your skill and your intelligence will make available to you, and those dependent on you. You are carving out your own career. You will have to decide what kind of a career you want. So make up your own mind. Don't ask anyone else to do it for you. But when you have made up your mind, be sport enough to go the way you have chosen without complaining afterwards because it didn't work out the way you thought it would. In other words, if you are primarily interested in what a labor union has to offer you, if you want to organize your life on that basis, and cast your lot with organized labor then your course is clearly open to you. The chances are that the profession of engineering will not give you what you are after.

"On the other hand, if you have in mind that there is something to this thing we call the profession, something for you that you really do value along with the pecuniary compensation you may get now and later on, the chances are that the labor union will not give you what you are after. You have a perfect right to make your own decision as to what road you want to take. To a young man that does not mean that he cannot change his course up to a certain point on his road. But once he has passed that certain point the chances are that there will be no turning back. He will have done something to himself and to his outlook on his life and work that will

go far toward disqualifying him for the other field of service.

I have great sympathy for the young men today who are being paid less compensation than are the unskilled, uneducated mechanics with whom they must work every day. I think, however, that in many cases they have a mistaken impression as to compensation and actual earnings. I think many of these young men are comparing the monthly salary of an engineer who is employed throughout the year with the daily wage of a man who is employed only a small part of the time, and who may already be at the top of his earning power. There is a certain amount of that.

Many have limited futures

I recognize also that there are many thousands of these young men who never will have an opportunity to do any more responsible work than they are doing. I use the word responsible, not to measure difficulty or complexity; they may well acquire with experience far greater skill and capacity. I mean that they will remain as employee-engineers responsible to some employer-engineer. There is little use in talking of professional future to men who know that they are close to the limit of their earning capacity. But if they are to remain on that job or that kind of job and if they are willing to cast their lot with that of the craftsman and the manual worker I cannot see why the professional engineers should try to build a professional umbrella big enough to take them in.

I think that out of all this will come a natural separation by the individual. I do not think that it will be done by any acts of this group or any professional society or any other body. I think that the individuals must find themselves. I think you will find that some will go the way of the labor organization. They will definitely align themselves with that group. They will consider their immediate and material interests of today. If they have any professional heritage they will be willing to sell it for the pottage of immediate benefits. Let us not shake our heads at them. That is their business. They do not owe the rest of us a thing. If they decide that that is the road they want to follow, they have a perfect right to follow it and hold their heads just as high as does any craftsman who organizes to better his economic conditions. I don't think we should frown at them or call them names or anything of the sort. That is their own business.

Make the profession attractive

On the other hand, if we do our job, and I am speaking now in behalf of the professional group, in making this profession look attractive to these men, in making this profession seem worthwhile to them, in stimulating their interest in those things that are not concerned exclusively with today's material interest—then the men that can be interested in those things will follow the professional standard, and sooner or later they will find themselves in positions of greater or less responsibility in the profession.

My counsel is, let's not get too excited about it. Let's not think that we can shape the destinies of the engineering profession by legislation or that we can solve the problems of engineering employment by denunciation of this movement or that organization. Let us recognize that regardless of present difficulties the long term welfare of the profession and its members will be worked out by the individuals, each pursuing a course that seems to him to be sound and proper according to his light. Only as we pursue that course shall we achieve stability and order progress.

We do have a real responsibility to see that every side of the question is thought through and made available to the individuals. We have the duty of presenting the arguments in favor of our own views. We must try to have men see long-term as well as short-term results of their acts.

These young men do not know how to answer that question and I do not know what to tell them. We can tell them how it looks from where we sit, but we are not going to live their lives. They must live their own lives. When they catch up with the problems that are worrying them, we may be dead. What we think about their problems now will not help them very much then.

Therefore, and in conclusion, I would say to this group of engineering examiners, having in its custody the statutory instruments of professional life, you have been designated to wield an instrument designed to help fashion this calling of ours into a profession. You have one instrument, but that instrument cannot do it alone. The professional engineering societies of long standing are another of the instruments that must be used to shape our profession. Our engineering schools are another. The conditions of employment are another.

Through all of these it is possible for us to create a profession that will measure up to its responsibilities. Each of these contributes its part: technical and intellectual fitness, a professional conscience that assumes a responsibility to the community for the standards of its members, an attitude toward the day's work that is distinct from that of the time-server, the police power of the state administered to safeguard the people against injury at the hands of the unworthy.

What the profession offers

In doing its own part of this job, each of these contributing groups must keep in mind both the immediate and the ultimate aspects of the whole broad problem. We are dealing with conditions that will affect the lives of thousands of young men now on the threshold of the profession. You and I believe that those of them who are of professional caliber, will be much better off if they go the professional way. Even though they may have to take it on the chin today, we feel that they will get something out of the professional life that will be worth more to them than what they now may sacrifice.

Let us then organize our societies and enact our statutes; let us organize our schools to educate these young men and let us do our best to establish working conditions that will recognize sound relationships between employers and employed. Thus we can make clear to them early in their careers the significance of membership in a profession, what it offers and what it does not offer. Let us do all we can to educate these young men to what a profession is, what it stands for and what it offers to them in return for what it demands. And when we have done that well, so that they can see the situation clearly let each of them say under which standard he will serve. That is the best that I now can see to offer. I see no royal road or shortcut to the solution of that problem.

THE WEEK'S EVENTS

(Continued from page 811)

Water Men Endorse Pension Plan

Resolution passed at Missouri Valley Section of American Water Works Association

State retirement and pension plans for water works employees were endorsed by water works men from five states in a resolution adapted at the Fall convention of the Missouri Valley Section of the American Water Works Association, meeting at Omaha, on November 4-6. Adoption of the resolution followed vigorous cloakroom discussions of the lack of provision in the Federal Social Security Act for municipal employees.

Harry E. Jordan, national A.W.W.A. secretary, reported that membership in the national body had grown to 3050. He described a movement to establish an affiliate member grade with lower dues and restricted service and reported on progress of the water works practice committee. Revision of the ten-year-old manual, which the committee has under way, will represent, he said, the composite views of the water works field, and will state basic principles which can be used by members. The committee is completing a monograph on water purification which it is expected will be approved for publication at the January board meeting.

Pipe specifications

Rapid progress also has been made on specifications for cast iron pipe since the lively discussions which occurred at the Buffalo convention of the A.W.W.A. The committee which has this matter in hand had let the matter drag more than ten years, until pit-cast pipe is now only about 15 per cent of the total used. Mr. Jordan predicted that a cast iron pipe specification will be forthcoming within two or three months and pointed out that when a specification cannot be produced within three or four years, interest lags. Specifications for laying pipe and for valves and hydrants are nearly completed.

A number of papers relating to water sources, dealing particularly with wells and rainfall trends were read. Rate valuations and water works ordinances were subjects discussed in the field of administration, and attention was also given to analysis of water systems and to plumbing. The subjects handled in papers on treatment methods included softening, filter problems, algae control, and the use of bentonite as a coagulant.

Convention cities

It was announced that, as a result of a mail vote, convention meeting places for the section would be restricted to a few of the larger cities. Next year's meeting will be held at Des Moines. E. L. Waterman, secretary-treasurer reported that the Omaha Hotel, at which the meeting was held, had made improvements and changes to bring its plumbing within the requirements of the State Board of Health as being free from cross connection and backsiphonage.

Officers elected for the coming year are as follows: Chairman, Dale L. Maffitt; vice chairman, B. L. Ulrich; secretary-treasurer, Earle L. Waterman (also section representative as director to the national association); directors, for Iowa, C. Q. Alexander; for Missouri, Clarence Hoen; for Kansas, F. A. Rathert; for Nebraska, Lee Nelson; and for South Dakota, E. R. Mathews.

STEPS TO FLOOD CONTROL

EXCAVATION for the left abutment of the Marshall Ford Dam, being built by the Bureau of Reclamation on the Colorado River of Texas. This dam is one of three in a series planned by the Lower Colorado River Authority of Texas for power, irrigation and flood control on the Colorado River above Austin, Texas.

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Sanitary Classifications Set For Metropolitan Waters

Water areas along the south shore of Long Island, lower New York Bay, and Raritan and Sandy Hook Bays have been tentatively designated by the Interstate Sanitation Commission to be maintained in a state of purity which will permit bathing and shell fish growing. The commission is an interstate body representing New York and New Jersey and has jurisdiction over the waters of the New York City metropolitan district, extending from Sandy Hook to Fire Island inlet and up the Hudson River to a point just north of the Bear Mountain Bridge, as well as portions of Long Island Sound. The findings of the commission are transmitted to existing health agencies in New York and New Jersey, and also in Connecticut, which is expected in the future to join with New York and New Jersey in the anti-pollution work.

The Class-A designation was given to these waters on the recommendation of Seth G. Hess, chief engineer of the commission, after a series of public hearings held during the summer, at which testimony was taken on the present and anticipated use of the water areas under examination. As regards the waters now classified, there was nearly unanimous agreement at the hearings by civic bodies, public officials, and taxpayers that the waters should be kept in a high state of purity.

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Trade Name in Bid Call Upheld by Court

It is legal for a city to use the trade name of an article in a call for bids, even though only one company manufactures the article or material desired, the Washington state supreme court ruled recently. The ruling was made in a case brought by the city of Seattle and established the city's right to advertise for "Mazda" lamps.

The ruling set aside a previous decision of the King County superior court at Seattle, which had held that the city's procedure violated a provision of the city charter requiring competitive bidding on purchases.

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

PORTLAND CEMENT ASSOCIATION, annual convention, Blackstone Hotel, Chicago, Nov. 29-Dec. 1.

AMERICAN STANDARDS ASSOCIATION, annual meeting, Astor Hotel, New York City, Dec. 1.

HIGHWAY RESEARCH BOARD, annual meeting, Washington, D. C., Dec. 1-3.

THE ASPHALT INSTITUTE, national asphalt conference, Memphis, Dec. 6-13.

ASSOCIATION OF ASPHALT PAVING TECHNOLOGISTS, annual meeting, Memphis, Dec. 6-11.

AMERICAN ENGINEERING COUNCIL, annual convention, Washington, D. C., Mayflower Hotel, Jan. 13-15.

SECRETARIES OF ENGINEERING ORGANIZATIONS, annual conference, Washington, D. C., Mayflower Hotel, Jan. 13-15.

AMERICAN ROAD BUILDERS ASSOCIATION, road show and convention, Cleveland, Jan. 17-21.

AMERICAN WOOD PRESERVERS ASSOCIATION, annual meeting, Chicago, Congress Hotel, Jan. 18-20.

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual meeting, New York City, Jan. 19-21.

ENGINEERING INSTITUTE OF CANADA, annual meeting, London, Ont., Jan. 31-Feb. 1.

REGIONAL AND LOCAL

INDIANA SOCIETY OF PROFESSIONAL ENGINEERS, annual meeting, Indianapolis, Ind., Dec. 10.

NEW JERSEY ASSOCIATION OF PROFESSIONAL ENGINEERS AND LAND SURVEYORS, Elks Club, Jersey City, N. J., Jan. 14-15.

NEW YORK STATE SEWAGE WORKS ASSOCIATION, annual meeting, New York City, Jan. 20-22.

NORTH CAROLINA SOCIETY OF ENGINEERS, Raleigh, annual meeting, Raleigh, Jan. 28-29.

ELECTIONS AND ACTIVITIES

AN ARCHITECT, John W. Henry, has been elected president of the South Dakota Society of Engineers and Architects. John F. Jacobs, the retiring president, was elected vice-president, and W. W. Towne, state sanitary engineer, was re-elected secretary-treasurer.

A DISTRICT CONFERENCE was organized early this month of student chapters of the American Society of Civil Engineers in Wyoming, Montana and North and South Dakota. Robert Peterson was elected chairman and Robert Simmons secretary-treasurer; both are from South Dakota State College. Robert Hastings, of the University of Wyoming, was elected vice-chairman.

AN ORGANIZATIONAL meeting of the new West Virginia chapter of the American Society of Civil Engineers chose C. P. Fortney as president, Burr H. Simpson and William Brewster as vice-presidents, and T. A. Polansky secretary-treasurer.

MAJOR THEME of the fall meeting last month of the Texas section of the American Society of Civil Engineers was the new Texas registration law. Attention was also devoted to city planning and the wood pulp and oil industries. Life memberships were given to F. D. Hughes, John B. Hawley, R. A. Thompson and T. U. Taylor. New officers are: president, J. T. L. McNew; vice-presidents, H. N. Roberts and R. J. Cummins; secretary-treasurer, J. A. Focht.

A REPLY to President Roosevelt's recent plea for socially trained engineers was made by President Williams of Lehigh University at a meeting late last month of the Allegheny section of the Society for the Promotion of Engineering Education. Dr. Williams said that the primary objective of engineering education must necessarily be to prepare for the proficient practice of engineering. President Doherty of Carnegie Institute of Technology deplored the separation in the student's mind of mathematics, physics, and mechanics and urged frequent inter-departmental meetings in the interests of unification of objectives. New officers of the Allegheny Section are: president, Prof. L. C. McCandliss, University of Pittsburgh; vice-president, Prof. C. S. Keevil, Bucknell University; secretary, Prof. C. B. Jenni, West Virginia University.

THIRTEEN Western New York engineers who have been members of the American Society of Civil Engineers for 35 years were awarded life membership certificates at a luncheon in Buffalo, N. Y., Nov. 9. Seven are members of the Buffalo section of the society. Those to receive the award are: George B. Bassett, president, Buffalo Meter Co.; John W. Cowper, president, John W. Cowper Co., Inc.; Walter McCulloh, retired; Francis J. Tresise, president, Erie Contracting Co.; Frederick K. Wing, president, Frederick K. Wing Co.; Carl L. Bannister, retired; Leslie J. Bennett, Buffalo Cement Co.; William B. Bennett, Niagara Falls Power Co.; Douglas Cornell, structural engineer, Buffalo department of public works; Schuyler Hazard, civil engineer; Charles J. H. Moritz, vice-president of Aluminum, Ltd.; Harry L. Noyes, chief engineer, Union Carbide Co., and John N. Ostrom, retired.

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License Examinations

Iowa: Examinations for professional engineering Dec. 7-8 and for land surveying Dec. 9 at Des Moines.

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Road School Postponed

The University of Kentucky Road and Street School which was scheduled to be held Dec. 6-9 at the College of Engineering, Lexington, Ky., has been indefinitely postponed. It is planned to hold the school after the engineering department building program has been completed so that space will be available for exhibits.

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Feather River Power Plans Meet State Opposition

Opposition to the plans of the Pacific Gas & Electric Co. for additional power development on the Feather River in Calif. (*ENR*, Oct. 14, p. 615) has been expressed by Earl Lee Kelly, state director of public works, on the ground that the additional power may make it difficult for the state to dispose of the power it plans to develop at Shasta Dam. The latter structure, formerly known as Kennett Dam, is part of the Central Valley irrigation project now to be built jointly by the state and the federal government. Mr. Kelly stated that there would be no objection to the P.G.&E. plant, provided its output would be absorbed before the Shasta plant comes into service.

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Prequalification Underway In West Virginia

A register of contractors, classified as to the type and amount of work which they can handle, is to be set up by the West Virginia state roads commission. The commission has sent out a comprehensive questionnaire to all contractors who bid on state work during 1937, answers to which will be used to compile the register. Registration was provided for by the 1937 session of the state legislature. Only contractors who are registered will be allowed to bid on highway department work, and they will only be allowed to bid in the classifications and amounts assigned to them.

PERSONAL

MAJ. JAMES D. ANDREWS, JR., U. S. Engineers, has been transferred from Spartanburg, S. C., to the Memphis district as assistant to the district engineer.

GEORGE E. MARKS, formerly municipal engineer of Torrington, Wyo., has been appointed division engineer at Valley City for the North Dakota state highway department.

CAPT. ROBERT K. MCDONOUGH, Corps of Engineers, has been transferred from Fort Belvoir, Va., to the Little Rock district to take charge of construction of the Fort Supply, Oklahoma, dam and reservoir.

E. W. BAUMAN who resigned recently as engineer of materials and tests of the Tennessee state highway department, has become highway materials engineer for the Toncan Culvert Manufacturers Association, Cleveland.

ALBERT J. LEAMY, who has been resident engineer for the British Columbia government on the Pattullo bridge over the Fraser River at New Westminster, has been appointed permanent superintendent of the structure. Mr. Leamy was junior engineer for the firm of Armstrong and Morrison on the construction of the original Fraser bridge in 1904, and he has been a bridge engineer for the provincial government for many years.

JOSEPH B. DIAMOND, formerly an engineer for the New York City Board of Transportation and the Board of Water Supply, has opened an office in New York City for the general practice of law.

E. N. GUSTAFSON, for the past two years on the engineering staff of the Portland Cement Association, has been appointed assistant district engineer for the association in Austin, Texas. Mr. Gustafson, a graduate of Southwestern University and the University of Texas and formerly city engineer of Bay City and Palacios, has been active for many years in the Texas Gulf Coast section in irrigation, conservation and flood control work. He was for several years chairman of the governor's state engineers committee on the Colorado River watershed, and has served as resident engineer and division engineer for the state highway department.

W. L. CHADWICK has resigned his position as senior engineer for the Metropolitan Water District of Southern California to take a position with the Southern California Edison Co. in Los Angeles. Mr. Chadwick was previously connected with the Edison Co. from 1922 to 1931, leaving the company to join the water district staff.

THOR BJORNSTAD, for four years assistant engineer in the Denver offices of the Bureau of Reclamation, is now in the bridge designing division of the Washington state highway department.

HAROLD R. FLINT resigned recently from his position as district engineer of the Idaho state highway department.

C. A. KELLY, formerly resident engineer for the Idaho highway department, has become district engineer of the Pocatello district, succeeding Mr. Flint.

GEORGE DAVIDSON, who has been connected with the Colorado state highway department for the past two years, has been made resident engineer inspector for the Resettlement Administration at Miles City, Mont.

J. VERNON OTTER, Idaho state PWA director until that position was abolished Nov. 1, has been made manager of the Idaho Blueprint & Supply Co. of Boise.

S. C. HOLLISTER has been appointed dean of the College of Engineering of Cornell University. Professor Hollister has been acting dean since the death of Dean Diederichs last summer; he was formerly associate dean of the college and at the same time was director of the school of civil engineering. Dean Hollister came to Cornell in 1934 from Purdue University, where he was professor of structural engineering. He was educated at Washington State College and the University of Wisconsin and became instructor in mechanics of the University of Illinois, serving until 1917. He then became research engineer of the Corrugated Bar Co. of Buffalo. During the war he was with the U. S. Shipping Board Emergency Fleet Corp. and at the end of that service he entered private practice in Philadelphia as a consulting engineer. He took the teaching position at Purdue in 1930. Coincident with his teaching career, Dean Hollister served as consultant on penstocks at Boulder Dam.

HERMAN FELDBLET has been made chief engineer of the Woodcrest Construction Co. He has formerly served with the Rosoff-Brader Co., the P. J. Carlin Contracting Co., and the Goldberger Raabin Co.

FRANK P. FIFER, formerly principal engineer on flood control work in the Boston office of the U. S. Engineers, has transferred to the Binghamton, N. Y. district where he is directing the design and construction of flood control projects.

ROBERT S. MAYO, formerly with Ransome Concrete Machinery Co. and the Blaw-Knox Co. as designing engineer on steel forms and compressed air tunneling equipment has established offices in Lancaster, Pa., to design and furnish traveling steel forms and airlocks for tunnels or caissons.

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Standard Grades for Coal Under Discussion

Efforts to introduce standard grades for bituminous coal for general use by producers and consumers are being initiated by the Consumers' Counsel of the Bituminous Coal Commission. The Counsel has just recommended to the Commission that nomenclature and classification by grade and size of bituminous coals be set up in definite standards, in order to bring about uniform description of coals and give the purchaser definite information for use in ordering and accepting coal.

At present the coal commission is preparing to establish minimum prices, under the Bituminous Coal Act of 1937. Public hearings on these prices are to be held shortly. Before this hearing it is planned to hold a conference of coal consumers, notice of which may be obtained by applying to the Consumers' Counsel, Box 483, Washington, D. C. A statement of the proposal respecting nomenclature and grading has just been published in a pamphlet, "How Much Heat", issued by the Counsel.

The purpose of the present movement is to bring about the adoption of standards before minimum prices are promulgated, as prices fixed in the absence of definite grade classification might prove unsatisfactory. Under present conditions the general consumer of bituminous coal is largely in the dark as to the quality of coal which he buys.

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Hearings To Be Held On Refuge Harbor

A series of hearings to determine the cost of establishing harbors of refuge in the Great Lakes for light draft vessels will be begun by U. S. District Engineers Nov. 30 at Duluth. The hearings are called in compliance with a provision of the River & Harbor Act of 1937, which calls for a preliminary examination and cost survey of such a program.

Further hearings are scheduled on the following dates and places: Houghton, Mich., Dec. 3; Rochester, N. Y., Dec. 6; Cleveland, Dec. 8; Detroit, Dec. 10; Chicago, Dec. 14; Milwaukee, Dec. 15; Muskegon, Mich., Dec. 17.

OBITUARY

WILLIAM D. ARMSTRONG, bridge engineer since 1924 of the Los Angeles county road department and connected with the department since 1909, died Nov. 5 at the age of 65. After two years study of engineering at Oaheu College in Hawaii, Mr. Armstrong spent three years as a draftsman for the Honolulu Iron Works and later served for a time as draftsman and transitman for the Los Angeles Pacific R.R. and the Pacific Electric Ry. and as chief draftsman for the Los Angeles Ry. Then after two years with the U. S. Bureau of Reclamation, he joined the county highway commission, first in charge of design, then as senior bridge draftsman and finally as bridge engineer.

JAMES R. STIRRAT, 71, a construction engineer of Seattle, Wash., connected with the contracting firm of Stirrat and Goetz and a former vice-president of the Superior Portland Cement Co., died in Seattle Oct. 22.

CHARLES M. WARNOCK, president of Charles Warnock & Co., Montreal inspection engineers, died in that city Nov. 4 at the age of 64. A graduate of Illinois State University, Mr. Warnock served with the Illinois Steel Co. and later with the Robert W. Hunt Co. of Chicago. In 1905 he founded the Robert W. Hunt Co. of Canada in Montreal, later becoming its president. He established his own construction company in 1926, remaining at the head until his death.

COL. JAMES G. WARREN, 79, who has been consulting engineer for the Niagara Falls Power Co. since his retirement from the U. S. Engineer Corps in 1922, died Nov. 1 in Buffalo, N. Y. At the time of his retirement from the Corps of Engineers, Colonel Warren was division engineer of the lake division, a member of the Mississippi River Commission, and district officer in charge of the Buffalo district. Colonel Warren graduated from the U. S. Military Academy in 1881, and after serving through the various grades of the army he received the rank of colonel in 1912. He served at various times at Chattanooga, Louisville, Milwaukee, and Cincinnati and was for several years in charge of the investigation of diversion of water from the Great Lakes and Niagara River and of construction of developments at Niagara Falls for generation of additional power.

T. WILLIAM THRUM, until his retirement three years ago civil engineer for the Territory of Hawaii, died Nov. 3 at Edmonds, Wash.

GUY R. KENNY, 55, formerly assistant engineer for the Railroad Commission of California and later statistician and valuation engineer for the San Joaquin Light & Power Corp. and Ford Bacon & Davis, died Oct. 30 in Los Angeles. Mr. Kenny was a graduate of the University of Iowa.

MICHAEL SHIRLEY, 87, head of the Shirley Construction Co. of Omaha, died there Nov. 8. Mr. Shirley had been in the construction business in Omaha for more than 50 years, and had done much railroad construction for the Burlington R.R. and the Union Pacific as well as the Milwaukee R.R. and the Grand Trunk Pacific. He also constructed a section of the Canadian Northern. Mr. Shirley's more recent activities had been mainly confined to highway building in Nebraska and Iowa.

ALEXANDER F. STEWART, 73, who retired in 1922 from his position as chief engineer of the Atlantic division of the Canadian National Ry., died in Halifax, N. S., Oct. 30. Mr. Stewart joined the engineering staff of the Canadian Pacific Ry. shortly after his graduation from Dalhousie University in 1887. Eight years later he went to South Africa to serve on the engineering staff of the Imperial Military Ry. during the Boer War. Returning to Canada in 1906, he joined the engineering staff of the Canadian Northern Ry. in the Toronto office. He continued in the same position when the Canadian Northern was taken over by the Canadian National Ry., and in 1922 he was appointed to his position in the Atlantic division.

HENRY E. YEOMANS, division engineer for the Great Northern Railway at Grand Forks, N. D., died there Oct. 30 at the age of 52. After graduation from the Universities of Illinois and Colorado and a few years of construction work, Mr. Yeomans became construction engineer for the Great Northern. He was for two years supervisor of hotels and power plants at remote camps in Glacier National Park. For the last 20 years he has held his present position in charge of maintenance of 2,000 miles of line, said to be the longest division under the supervision of a single engineer.

CHARLES R. BETTES, who retired in 1931 from his position as chief engineer of the Long Island Water Corp., with which he had been connected since 1894, died Oct. 30 at the age of 74. A graduate of Columbia University School of Mines, Mr. Bettes worked for 12 years in the office of Charles B. Brush. In 1894 he joined the Queens County Water Co., later the Long Island Water Corp., as resident engineer, becoming chief engineer in 1897.

DONALD MACKENZIE, supervising engineer for Swift & Co., died Oct. 28 in Chicago at the age of 60. A graduate of Armour Institute of Technology, Mr. Mackenzie had been in the employ of Swift & Co. for 39 years and had built many of the firm's South American plants.

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Tunnel Contract Awarded On Sanpete Project

Contract for construction of the Spring City Tunnel of the Sanpete federal reclamation project in Utah has been awarded to Dan Teters & Co., Riverside, Calif. on their low bid of $128,000.

Construction of the Spring City tunnel will be the second step in the Sanpete project, which is designed to supply additional water for 19,500 acres of land in the Sanpete Valley. The first stage of the work consisted of construction of the Ephraim tunnel, which was begun in 1934 and is now completed. The two tunnels will divert water from the watershed of Cottonwood Creek, a tributary of the Green River of the Colorado River basin, to the San Pitch River watershed which drains into the Great Basin.

The Spring City tunnel, 5000 ft. long and 5½ to 6½ ft. in diameter, will divert 4,300 acre-ft. of water annually.

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Memphis Will Be Host To Asphalt Men

The Asphalt Institute and the Association of Asphalt Paving Technologists will sponsor the 11th National Paving Conference at Memphis Dec. 6. Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, will attend to outline the federal government's highway program, with special emphasis on the latest results of soil stabilization experiments.

Major themes of the conference will be highway economics, subgrade stabilization, asphalt highways, asphalt for airport surfaces, river and harbor protection, country highway sidewalks, soil erosion control, and moisture conservation. Three technical sections will include the reports and papers presented by the Association of Asphalt Paving Technologists.